
[Color index : Important | Prof. Zamzam Notes | Dr. Kholoud Notes | Extra] Editing file link

# Common Pediatric Lower Limb Disorders

## Objectives:

★ Leg aches.
★ Limping.
★ Leg length inequality.
★ In-toeing & out-toeing.
★ Genu varus & valgus.
★ Proximal tibia vara.
★ Club foot.
★ Deformities seen in cerebral palsy patients.

It is **HIGHLY RECOMMENDED** to check this summary "2 tables only" before you start

**THIS LECTURE WAS REVISED BY DR. KHOLOUD ALZAIN**

Best of luck!

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**References:** 435 Slides & Notes /435 A teamwork / Toronto Notes

# Leg aches

## What is leg aches?

It is pain in the legs, the most common cause of Leg pain is **Growing pain!** and this is what we will talk about

- ★ Benign
- ★ In **15 – 30 %** of normal children
- ★ In **females** more than **Males**
- ★ Unknown cause There is a theory says that it's related to growth spurt (bone grows faster than soft tissue), we have 2 growth spurts, one at the age 3-4 years and the second at the age 8-10 years
- ★ **No functional disability, or limping** لو كان ألم متعلق بالنمو المفترض ما يمنعه من الحركة و اللعب
- ★ Resolves spontaneously, over several years

## Differential Diagnosis:

it's dangerous to diagnose each Leg pain as growing pain, **it's a diagnosis of exclusion!** we exclude serious problems, mainly tumor by history and examination

- ★ Osteoid osteoma (presented with dull aching pain at night and responds to analgesia)
- ★ Osteosarcoma
- ★ Ewing sarcoma
- ★ Leukemia
- ★ SCA Sickle Cell Anemia it's very common! ask about family history and you may need to do sickling blood test
- ★ Subacute O.M Osteomyelitis

| History "Detailed" | Examination |
|---|---|
| • **Site**: At long bones of L.L (Bilateral)<br>• **Duration:** Of long duration (months)<br>• **Characteristics:** Dull aching, poorly localized<br>• **Relieving factors:** Responds to analgesia<br>• **Aggravating factors:** Can be without activity<br>• **Time:** Any time of the day but mainly at night make sure it's not tumor<br>• **Constitutional symptoms**: exclude malignancy | • **Long bone tenderness**: nonspecific not localised , large area, or none<br>• Normal joints motion painless |

## Management:

As growing pain is very benign, we do nothing to it, so first we have to roll out other serious conditions like tumors which need surgical intervention

- ★ **Reassurance**
- ★ Symptomatic:
  - ➔ Analgesia (oral, local)
  - ➔ Rest
  - ➔ **Massage**

# Limping

## What is limping?

★ An abnormal gait
★ Could be in one or both limbs

| History "Detailed" OSCE | Examination |
|---|---|
| • Limping is a symptom that could be caused by one of the following, so determine the cause by taking detailed history asking questions related to:<br>➔ **Deformity** (bone or joint)<br>➔ **Weakness** (general or nerve or muscle)<br>➔ **Pain** "Antalgic gait: (Video)" (where)<br>○ **Painful**: Trauma, Tumor, Infection.<br>○ **Painless**: Syndromic, Congenital, malunited fracture<br>➔ **Trendelenburg**: (Video)<br>○ **Gait**: hip abductor muscles weak<br>if bilateral = waddling gait (Vidoe)<br>○ **Test**: stand on 1 leg, if bend to other side test is +ve | • Gait good analysis<br>مهم يكون عندنا مكان واسع بالعيادة عشان نشوفه ماشي لمسافة طويلة<br>Localise the cause to choose the area of x ray<br>➔ Above pelvis: Back (scoliosis)<br>➔ Below pelvis: Hips (mainly), knees, ankles, feet<br>• Walking phase:<br>1. Stand phase the phase during which the foot remains in contact with the ground<br>2. Swing phase: the phase during which the foot is not in contact with the ground<br>• **Neurovascular** |

**Management:** Generalization can't be made.

★ **Treatment of the cause**: → If The cause was MSK that led to Limb Length Inequality

# Leg length inequality

## Etiology

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

## Adverse effects & clinical picture:

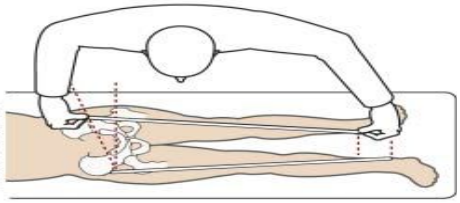
1. **Gait disturbance** first thing will happen is **limping**
2. **Equinus deformity** Then commonly the short limb will compensate by doing **plantar flexion** in the shorter limb → and with time this plantar flexion will become fixed forming deformity called "equinus"(pic), but sometimes the longer limb will flex the knee so the shorter limb will walk on the foot
3. **Pain**: back, leg after that the **pelvis will be tilted** → causing back pain
4. **Scoliosis**: secondary to pelvic tilt

# Evaluation

## True "This is what we are talking about"

**First the leg length is affected**

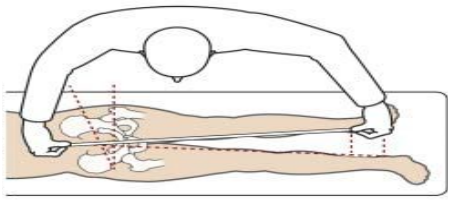
- If you measure it: one leg will be shorter
- with time this will lead to: pelvic tilt to adjust
- from ASIS to medial malleolus



## Apparent

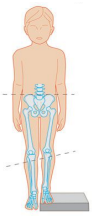
**The pelvis is not tilted, but there is no ASIS**

- The Leg length: will appear asymmetric.
- but if you measure it: they are with the same length.
- Xiphoid, symphysis pubis, umbilicus to medial malleolus



★ Screening examination (Clinical measures of discrepancy):

- While the patient **supine**:(Video) If there is pelvic tilt make sure that it's corrected then **by Measuring tape** measure true and apparent leg length
- While the patient is **standing**: Adding blocks under the short leg until the pelvis becomes elevated, so we can measure the blocks height in cm, which will indicate the amount of cm difference between the limbs (pic)



★ Galeazzi Test:(Video) To know where is the defect, is it in tibia or femur 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

★ Imaging methods (Centigram) accurate measure of legs length by X-ray. 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 b/w the 2 limbs in length & to locate where the difference is (femur/tibia).

# Management

Depends on the severity (>2cm)

الأهالي يشتكون من الرجلين مو متساوية في الطول، لازم تعرفون إن زي ما فيه أمراض تسبب قصر لإحدى القدمين، فيه أمراض تسبب طول

- If the difference between them is **less than 2 cm** = don't do anything, muscles will compensate, but if limping do physiotherapy to strengthen muscle
- If **more than 2 cm** = either lengthening the short (more common) or shortening the long

طبعا الأهالي يفضلون إننا نطول القصير لكن الأسهل على الجراح والأقل مضاعفات هو تقصير الطويل بس مشكلتها لما يكون الطفل أساسًا قصير ما ودك تسويها ويقصر زيادة

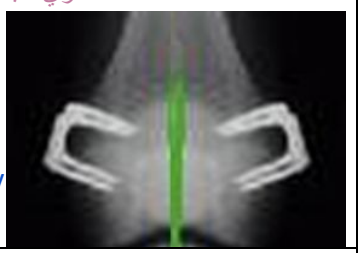
## For shorter limb

- **Shoe raise**

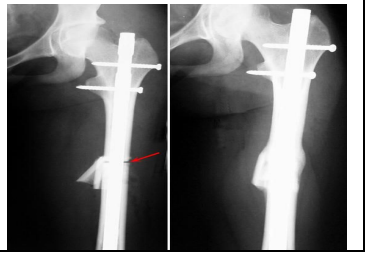
- **Bone lengthening**
  1mm/day, till correction is achieved which takes several months.
  - Observe the patient because of the neurovascular structure

## For longer limb

- **Epiphysiodesis** they have to be young
  By restriction growth plate
  زي الدباسة أحطها بكلا الطرفين للقروث بليت تمنع النمو
  - Temporary
    if the patient is really young
    أوقف نموها لفترة بعدين أشيلها
  - Permanent
    if the patient around 12-13 y
    لأن خلاص قرب يكتمل نموهم



- Bone shortening
  remove part of bone.
  usually we don't use it



# In-toeing & out-toeing

Could be **unilateral** or **bilateral**, commonly bilateral

## Out-toeing:

★ **Big toe** directed outward,
★ It's **rare** we will not focus on

## In-toeing:

★ **Big toe** directed inward
★ It's very common, more than you can believe and this is what we will focus on. It runs in families

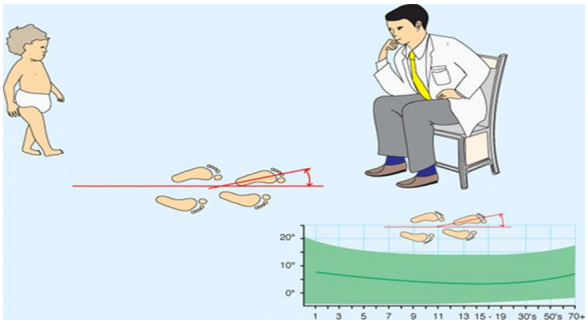
### History "Detailed" OSCE

★ **Onset** usually after walking age (Age: year to year and half)
★ **Who noticed it?**
عادة الجدات لهم الخبرة في مشية الأطفال
وينتبهون إذا المشية مو طبيعية 💗👍
★ **Progression?** usually tend to improve from a year to the other
★ **Fall a lot?** They fall a lot, even when they walk, but more if they run bc they lose control of their lower limbs → more internal rotation → fall.
They even come with bruises.
★ **How he/she sits on the ground?**
"W" shape sitting?
يجلسون ورجليهم جنبهم أو زي الضفدع؟
ما يرتاح في جلسة التربيعة؟
explanation in the next page

- We have to take detailed history to know what's the cause. Is it pure lower limb deformity, or there is cause of intoeing

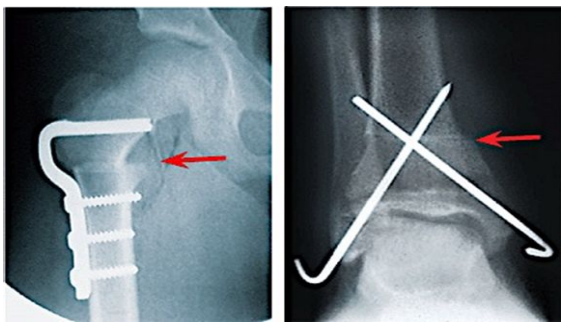
### Examination

★ This is in general, check the tables in the next pages for more details.
★ Screening examination (head to toe) We have to identify if it's pure lower limb deformity or there is another cause like cerebral palsy.
★ So it **is a clinical diagnosis not radiological**
★ **Foot Propagation Angle** "this an examination not a special test"
- الفحص هذا بشكل عام من حيث المبدأ، يعني ما يقصد به مستوى معين
- The doctor set in front of the child and ask him to walk in a straight line drawn in the land " they may use powder or water to see the steps"
- We don't walk with our feet straightforward, that's not our normal. **The normal is slight ex-toeing which is up to +15**. If the angle beyond 15 this is ex-toeing. **less than -10 degrees is intoeing.**
- **normal is (-10°) to (+15°)**.

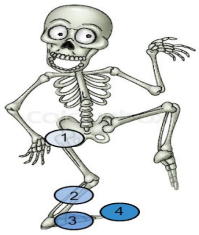



## Treatment This is general principles, check the tables in the next pages for more details

★ **Establish correct diagnosis**
★ Parents education
★ **Annual clinic follow up** → assess degree of deformity
★ **Operative correction indicated for children:**
→ (**> 8**) years of age with **significant cosmetic and functional deformity** <1%
○ Out-toeing: Usually does not improve spontaneously, Will need an operation: After the age 8y or if the foot propagation angle >30°



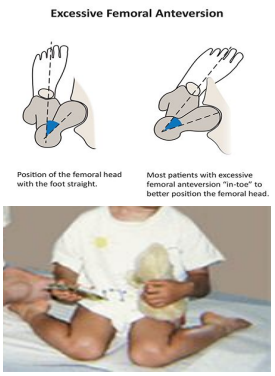
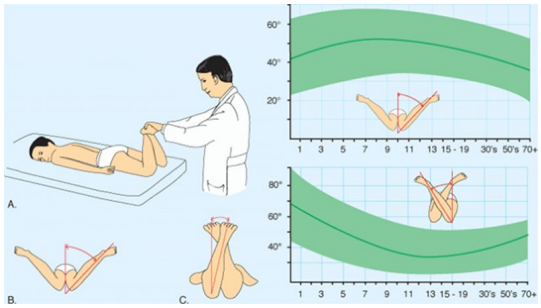
## Evaluation: (Video)

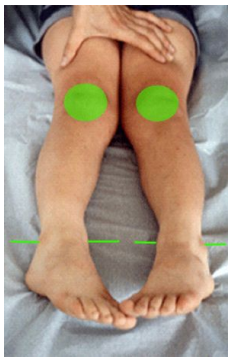
| The 4 levels | Just to remember it … |
|---|---|
| 1- Femur: ( increase anteversion) |  |
| 2- Tibial: (Torsion) | |
| 3- Foot (Forefoot adduction) | |
| 4- Big toe (Wandering) | |

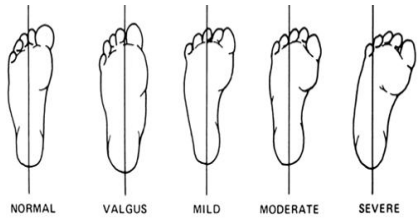
★ The cause could be at 4 levels, so we do examination to localise where is the abnormality in order to treat it

★ Differentiate between these 2 terminologies:

- Torsion= abnormal limb rotation happens when normally the relationship between 2 parts of bone is straight but فجأة ما صاروا ستريت
- Anteversion= normal variations of limb rotation, normally there is التفاف between 2 parts of bone = not straight, but التفاف زاد

| 1- Femur | increased angle of femoral anteversion "not the hip joint" |
|---|---|
| What is it? | ★ Version: when there is normally **rotation** between 2 parts of the bone creating an angle. This angle could be ante-version "one part is forwarded anterior in relation to the other" or angle of retro-vervios " like the relation between neck of the femur and femur shaft,<br>Normally the neck to the intercondylar is slightly more forward<br>→ **normal anteversion (10-15 degrees)**<br>we call it angle of anteversion, **here it's more excessive**<br>★ **Can't do further external rotation, but they do a lot of internal rotation**<br>That's why they like to sit W shape position بالعربي يجلس ورجلينه جنبه أو جلسة الضفدع.<br>Crossed leg on the ground needs external rotation → difficult on them<br>  |
| Examination | ★**Hips rotational profile:**<br>- Position: Supine or Prone<br>- Normal :Internal rotation /External rotation = 40-**45/45**-50 "total 90 degrees"<br>- In-toeing: if the angle increased **IR/ER** = 70-90 / 0- 20 "total 90 degrees"<br>- Out-toeing: if the angle decreased IR/ER = 0- 20 / 70-90<br>Supine<br>  <br>Prone<br>  |
| Treatment | ★ **Sit cross legged** هو مع الوقت بيتحسن واحنا نحثهم أيضًا على جلسة التربيع لأنه بيساعد مع إنهم ما يرتاحون فيها بس نحثهم عليها<br>★ If surgery is indicated in femur anteversion we do osteotomy and derotation |

| 2- Tibia: | Torsion |
|---|---|
| **What is it?** | ★ When normally there is no angle, between 2 bones, Medial tibial plateau with medial malleolus all in straight line once it rotated we call it torsion not retroversion<br>تخيلوها كأنها منشفة معصورة على جوا → inward torsion |
| **Examination** | ★ **Inter-malleolus axis:** (Video)<br>- Position: Supine or Prone / Or Sitting خاصة لما يكون بحضن أمه يبكي نخليه<br>- Description: To feel the 2 malleoli by your hand.<br>- Normal: lateral malleolus is posterior to the medial malleolus **by 30 - 35 degrees**<br>- **In-toeing:** "Internal Tibial torsion" **lateral malleolus will be directed little bit more anterior indicating mild tibial torsion.** If it becomes at the level of the medial malleolus "the intermalleolar axis becomes horizontal" **indicating moderate tibial torsion,** or **if it becomes even more anterior indicating severe torsion**<br>- Out-toeing: lateral malleolus is more posterior than usual<br>Supine  Sitting  |
| | ★ **Foot thigh axis**: (Video)<br>- Position: Prone<br>- Description: The physician **assesses the angle between the thigh and foot** with the knee flexed don't hold the foot keep it and take our goniometer منقلة put the Center on heel and then correct the long axis of the foot and get the long axis of femur and check the angle in between  <br>- Normal: **(0°) to (-10°)** يعني ابنورمال 30-<br>- In-toeing: if the angle decreased caused by internal tibial torsion<br>- Out-toeing: if the angle increased caused by external tibial torsion |
| **Treatment** | ★ **Spontaneous improvement** in embryology there is something called pre-axial and post-axial limb growing: the upper limbs grow inward then rotate outward, and lower limbs grow inward then rotate outward هنا كأنها بيكمل نمو لسا ويطلع زيادة على برا ويتعدل So treatment is observation till the age 8 years, if still significant then we operate<br>★ In the past they used to wear Derotation cables, but it shouldn't be used now! because it's expensive and has psychological effect on the child "feels different from others" So no need for it as the bone will be corrected by itself  <br>★ If physiological wasn't corrected after observation, or if it was pathological, then it will be treated by surgery "supramalleolar osteotomy and derotation"<br>العظمة ملفوفة بديهيا أكسرها و أرجع ألفها |

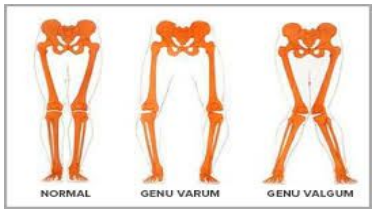
| 3- Foot: | Forefoot adduction |
|---|---|
| What is it? | When you come and examine the patient you have to look to the foot **from plantar side** → kidney shaped foot → then we see is it correctable or not, usually it's fully correctable |
| Examination | ★ **Heel bisector line**<br>- Description: بس نطلع قلم من جيبنا ونحطها بالكعب ويكون مرتاح مو محركها<br>- Normal: along 2 toe Pen axis between the 2nd toe and 2nd web space<br>- In-toeing: If it passes lateral to the third toe<br>- Out-toeing: If it passes medially<br>  <br><br>  |
| Treatment | ★ **Anti-version shoes, or proper shoes reversal** يا يشتري وحدة مخصصة أو حقته العادية بس يقلب اليمين يسار والعكس<br>ما البسه هالشوز الا لما يكون المشكلة من الرجل نفسها، نبغى جزمة جلدها قوي تدف الرجل مو تكون مرنة والقدم هل الي تدفها وكمان نقول لهم جزمة للبيت وجزمة للخروج ونشوفهم كل سنة<br>لو قلنا إنهم مروا الطبيب بعمر 2-3 سنوات لو عالجناهم بهالطريقة ووصلوا عمر 8-9 سنوات كم منهم يحتاج تدخل جراحي؟ 1%!! بمعنى إن الطريقة هذي تعتبر فعالة بهالعمر، لكن لو من البداية ما راحوا للطبيب إلا بعد 8-9 سنوات يصير التدخل جراحي<br>● معلومة خارجية "مواصفات الحذاء الجيد":<br>- من تحت يكون قوي عشان يسندك، إلي تكون مرنة وتتصفط ما تنفع، المرضى بالعيادة إذا سألوا الدكاترة عن مواصفات الحذاء الجيد هذه أول نقطة يذكرونها لهم وعشان يقنعونهم يأشرون لهم على الكرسي إلي يجلسون عليه "زي ما أحتاج الكرسي يكون من فوق اسفنج ومريح أجلس عليه احتاج تحت الاسفنج يكون قاسي يسندني، بالضبط مثل الحذاء!"<br>- من جوا يكون مريح وفيه ارتفاعة الـ medial arch<br>- من قدام عند الأصابع يكون واسع<br>- من برا يكون جلد قوي يحمي القدم<br>- من ورا أيضًا يكون الجلد قوي يحمي الـ achilles tendon |

| 4-Big toe: | Wandering |
|---|---|
| What is it? | - When the big toe is adducted alone. it's **rare**<br>- يعني لو تغطون البيق تو لحاله يصير شكل الرجل ما فيها انحراف |
| Examination | - We can see it there is no special test<br>  |
| Treatment | ★ **spontaneous improvement** |

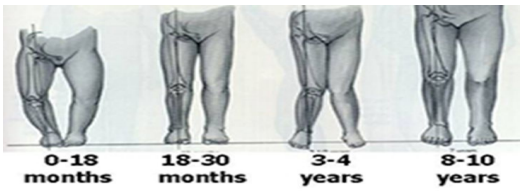
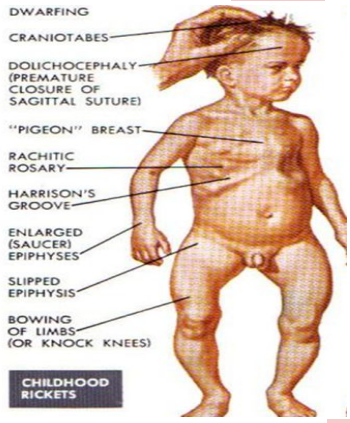
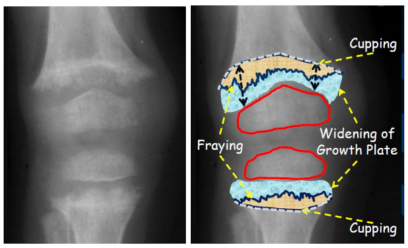
- The important thing is that it could be combination of more than one level, which means if you examine the foot and find it abnormal you have to complete your examination maybe there is other abnormalities for example; mild femoral anteversion in the left, moderate tibial torsion in the right, severe forefoot adduction in the left…

# Genu varus & valgus

★ **Genu varus** = bow legs
★ **Genu valgum** = Knock knees

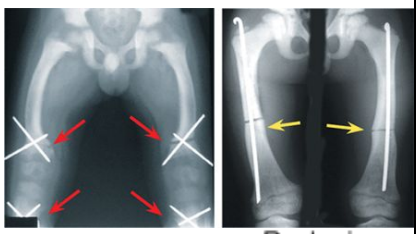



## The difference between Physiologic and Pathologic MCQ!

| | Physiologic | Pathologic |
|---|---|---|
| Examples | **The natural history for genu (knee) development in 90% of children:**<br>1. Varus: Up to 1.5 year because of the child position in-utero "common complaint in new parents with 1st child". We take detailed history and do PE to make sure everything is normal then we say by exclusion this is a physiological varus<br>2. Straight 1.5 - 2.5 yo<br>3. Excessive Valgus 3-4 yo (reach 20-30 degrees)<br>4. Normal Valgus 8-10 yo (M: 10 degrees - F: 15)<br>  <br><br>❖ زمان كانوا يحرصون على مهاد الأطفال جهة الأقدام عشان يمنعون الفارس و الفلقس يبونها تصير ستريت، مع إنها طبيعية | **Rickets,** trauma, infection, tumor or syndromes<br>The most common after physiological is **Rickets:**<br>- Clinical signs of **Rickets** MCQ!:<br>  <br><br>- Radiological findings of **Rickets** MCQ!:<br>  <br> |
| Compare | - Always Bilateral (symmetrical)<br>- Mild to moderate "acceptable"<br>- Common<br>- Family history usually negative<br>- Diet is normal<br>- Good health<br>- Growth follows normal pattern<br>- Height normal<br>- Onset at 2nd year for bowing, 3rd year for knock knees | - Can be Unilateral (symmetrical /asymmetrical)<br>- Severe, often beyond +- 2 Standard Deviation<br>- Rare<br>- May occur in family<br>- Diet may be abnormal<br>- Other MS abnormalities<br>- Variable effect of growth<br>- Height less than 5th percentile<br>- Out of normal sequence of genu development often progressive |

## Evaluation[1]

- ★ History: (detailed)
- ★ Examination: (signs of Rickets)
- ★ Laboratory: (Ca level and vit.D, phosphorus)
- ★ Imaging: (Centigram)
- ★ There is something called anatomical "mechanical" axis to know if there is genu varum or genu valgum (normal: center of the hip to the center of the ankle should cross the center of knee). if the knee is internal to the axis this is valgus, if the knee is outward this is varus

<table>
<tr><th colspan="2">Management</th></tr>
<tr><td rowspan="2">Non-operative:</td><td>★ Physiological: Observation<br>usually reassure and see them again within 6 months to 1 year</td></tr>
<tr><td>★ Pathological must treat underlying cause, (e.g. in Rickets give vit D)<br>Medically: roll out rickets and if so, refer to pediatrics treat the child medically until he is biochemically normal and the varus or valgus starts to heal or improve, after 2 years if there is still varus or valgus we call it: "healed rickets with residual valgus or varus" now we can treat it surgically with osteotomy أسماء العمليات مو معكم</td></tr>
<tr><td rowspan="2">Operative</td><td>★ Epiphysiodesis "guided growth"<br>Valgus: Insert clip on medial side of bone to stop it from growing and allowing the lateral side to continue growing<br>Varus: Insert clip on lateral side of bone to stop it from growing and allowing the medial side to continue growing<br>فرقه عن الي ذكرناه بتوقيف نمو الرجل الطويلة, اننا هنا ما راح نحطها بجهتين، بنحطه في جهة وحدة فقط لو فالقس احطها من جوا تمنع الركبة من إنها تدخل زيادة عن الاكسيس، ولو فارس أحطها من برا تمنع الركبة تطلع زيادة عن الاكسيس.<br>  <br>Once normal level is reached we remove the staples.<br>(New methods, Small mini figure of 8 plate for young. we put the plate in the side we want)<br>قبل البلوغ لأني اعتمد على القروث بليت اوجهه لو كان مو موجود ما راح يستفيد.<br>If it's valid that's good, if not then go for corrected osteotomy</td></tr>
<tr><td>★ Corrective osteotomies أسماء العمليات مو معكم<br>- if the patient is near skeletal maturity[2]<br>- we fix it with K wire or IM nail<br>- Rush pin is a very strong form of k-wire<br>- Varus usually corrected from tibia<br>- Valgus usually corrected from femur<br>  <br>Rush pins</td></tr>
</table>

[1] one of the complications is early osteoarthritis

[2] نسأل الأم عن سن البلوغ في العائلة إذا كانت بنت مصابة

# Proximal tibia vara

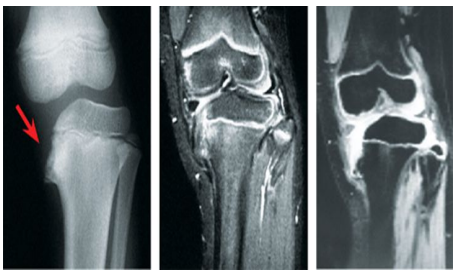
## What is Proximal tibia vara?

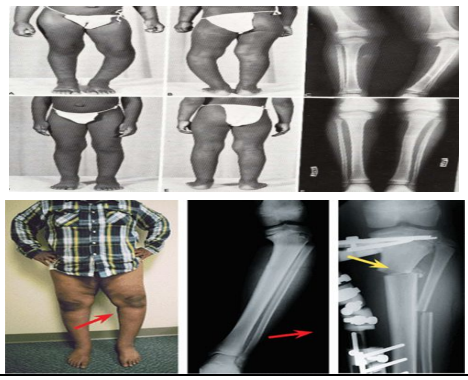
★ It is called also "**Blount disease**" A specific category of genu varus.
★ Damage of proximal **medial tibial** growth plate of unknown cause
★ Could be unilateral or bilateral

## Risk factors:

- Overweight
- Dark skinned

| Types | |
|---|---|
| ★ Infantile | < 3y of age, usually (Bilateral) & early walkers<br>- Dependent walking يمشي ببساعدة مثلا يمسك الأثاث و لايمسك اصبع أحد يمشيه<br>- Normal walking age (independent walker): 12m +/-2m (10-14 months)<br>- Delayed walking age: after 18m<br>أبكر وقت للمشي هو 10 شهور ، طيب متى أحطه في الجلاسة؟ إذا قدر يجلس بنفسه يدل على إنه قدر يتحكم بالترنك بدري خلاص تمام حطوه بالجلاسة بس ارفعوها عشان رجله لا تلمس الأرض لا يحط وزنه على الركبة |
| ★ Juvenile | 3-10 y, combination (bilateral) |
| ★ Adolescent | > 10y, usually (unilateral) because of overweight |

| Evaluation | | |
|---|---|---|
| ★ X-Ray | • to differentiate between rickets and proximal tibial vara in x ray → this one has beak منقار<br>• M.D.A = metaphyseal diaphyseal angle [3] |  |
| ★ MRI | is mandatory (Why? For staging)<br>to know how much of the cartilage is distracted we have to do MRI, so we can stage it in order to treat it.<br>- Severe cases<br>- Recurrence | |

| Treatment | | |
|---|---|---|
| ★ Operative: Corrective osteotomies | - كيف أعالجه؟ هو خلقة من جهة الميديال متضرر هل تتوقعون زي الفارس العادية اسوي ايبيفيزيوديسيز واروح اوقفه كمان من جهة اللاترال؟ لا طبعا<br>- we correct it either by using gradual correction with external fixator or acute correction with high tibial osteotomy, Infantile bilateral → we do high tibial osteotomy.<br>- المهم لاحظوا ان هنا كل الخيارات جراحية ما فيه الخيارات الثانية مثل الفارس العادية |  |

[3] Metaphyseal Diaphyseal angle < 11° observe closely, Metaphyseal Diaphyseal angle > 15° operate

# Club foot

## Etiology:

- ★ Postural → **fully** correctable, needs only **intensive P.T**

  اول ما ينولد الطفل وأشوف رجله شكل القولف أحاول أعدلها بيدي،

  الطفل وهو منسدح أجي قدامه وأسوي حركة بسيطة زي الدغدغة من جهة اللاترال وأشوف بيصلح رجله من نفسه أو لا (المفترض أنه راح يصلح رجله من نفسه)، وبعدين أنا أسويها له باسيفلي من الهايندفوت، في حال تعدلت تعرف إن هذي سببها البوستشرال يعني وضع الجنين برحم أمه خلاص تطمن الأم وتحثها إنها كل يوم تعدلها

  To apply pressure on the lateral 1/2 of the hindfoot, in the direction of outward & upward (i.e. opposite to the direction of the deformity), for 5-6 sec, the quicker we do intensive physiotherapy, the quicker they resolve usually within 2-3 weeks, If it was done properly. (we exploit the relaxin before it subsides from the baby)
- ★ Secondary (Myelomeningocele Spina Bifida) → **rigid** deformity, patient needs workup

  طيب الاحتمال الثاني حاولت إنك تعدلها وما تعدلت: هنا افحصه من راسه لرجله اذا لقيت مرض يعتبر سكندري له فعلاجه اننا **نعالج المرض المسبب**

  Usually the patient has other serious conditions that needs taking care of in the NICU, but still we need to take care of the feet, usually we do stretching as the protocol of positional clubfeet, but the improvement we know will be minimal and it will take months, our aim is to keep the feet flexible till he/she becomes older than 9m of age to operate on them
- ★ Idiopathic (CTEV Congenital Talipes Equino Varus) → partially correctable **commonest of the 3**

  لو بعد الفحص ما لقيت سبب معين خلاص اعرف انها برايمري الي هي الايديوباثيك وهو أشهر شيئ نشوفه وراح نتفصل عنه بهالمحاضرة

## Characteristic Deformity:

- ★ **Hind foot:**
  - ➔ Equinus[4] (Ankle joint, tight A.T Achilles Tendon)
  - ➔ Varus (Tight Subtalar joint)
- ★ **Midfoot**:
  - ➔ Cavus[5] (pronation) **MCQ!**
- ★ **Forefoot**
  - ➔ Adduction.

## Clinical examination:

- ★ Club foot shape from golf club
- ★ Deformities don't prevent walking
- ★ Calf muscles wasting
- ★ Foot is smaller in unilateral affection up to 2 sizes difference between 2 shoes
- ★ Callosities at abnormal pressure areas

  not like the normal sole where Fat pad in heel absorb whatever we are walking on

  إيعني متى تبان الكيلوزتي؟ بعد ما يمشي صح؟ ومتى يمشي؟ اقل شيئ نقول سنة
- ★ Abnormal cavus crease تجاعيد in middle of the foot
- ★ Normally navicular in the same axis of the talus, here navicular is so medially rotated → sometimes it reaches up to medial malleolus.

[4] is a condition in which the dorsi-flexion of the ankle joint is limited

[5] Cavus in the midfoot is the first part of the deformity of clubfoot. The arch of the foot is higher than normal.as a result of first metatarsal is plantar flexed in relation to the talus, putting the forefoot in a pronation position to the hindfoot

## Management:

★ The goal of treatment for is to obtain a foot that is:

- ➔ **Plantigrade**
  the whole foot on the ground for balance, we walk on tripod (**heel**, MP joint of fifth toe, MP joint of big toe) [6] عشان كذا مثلا لو بالديابيتك فوت بيصلحون له بيق تو امبيوتيشن يحاولون قد ما يقدرون يخلون الام بي جوينت لتوازن المشي
- ➔ **functional**
- ➔ **painless**
- ➔ **stable** over time

★ A **cosmetically** pleasing appearance is also an important goal sought by surgeon and family

| **Manipulation and serial casts** | |
|---|---|
| "Ponseti" serial casting | |
| up to 12 m | • Before they were starting with surgery but it has complications like epiphyseal destruction and stiffness so the child will not be able to play :( ! until Dr.Ponseti created the Technique of serial casting "Success rate is very high", so now we leave the surgery for certain indications<br>• we start as soon as we diagnose. After casting, the foot becomes normal and externally rotated<br>• Technique "Ponseti" serial casting weekly (usually 6-8w) (2 m)<br>• Validity up to 12-months, soft tissue becomes more tight the younger they are the better the result So if the patient < 12 months choose serial casting, if >12 surgery!<br>• **Avoid** false correction by going in sequence in Ponseti serial casting<br>• When to stop? not improving, pressure ulcers<br>  |
| "Dennis Brown Splint" | |
| up to 3-4y old | • Maintaining correction "Dennis Brown Splint"<br>• Shoes + bar "while the bar has the same distance between 2 shoulders<br>• Let's say we have a child that is diagnosed with clubfoot when he is 36 hours old → we start casting immeditly for 2 m then we put him on Dennis Brown Splint:<br>○ first 3 months after casting we keep the splint for 24 hours (now he is 5 m)<br>○ then for other 3 months. we keep splint for 12 hours a day (now he is 8 m use it only while sleeping bc in day time the child pull to stand, we're waiting for that pull to stand, bc if the baby stands the feet will be 90 degrees<br>○ if there was non-compliance the deformity will come back again and then we go surgical<br>  |
| up to 9 y[7] | • Follow up watch and avoid recurrence |

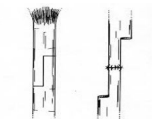
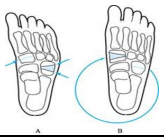
[6] If the heel is involved we do below knee amputation
[7] Foot develops until 9 year-old after that, is only growth

## Surgical treatment

**Indications for surgery:**

| | |
|---|---|
| >9 m old | • Up to 50% of Orthopedic consultants still follow the classic treatment: the mom does at home simple stretching physiotherapy till the age of 9m then we do PMLR (post-medial-lateral release), Bc growth plate + ossification center still developing, if before i'll cause AVN & more deformity<br>• Failure of conservative treatment<br>• Recurrence after conservative treatment |
| >12m old | • Late presentation<br>• Complementary to conservative treatment, as residual forefoot adduction Some forefoot adduction remains after serial casting so we do tibialis anterior tendon transfer (could be either split or complete transfer) |
| >9 y old | • The foot will need both soft tissue (PMLR) and boney procedures. But sometimes this is not possible because the deformity is severe and the neuromuscular as well as skin are very tight medially, therefore we do the **correction gradually** by using the TSF or Ilizarov (these rings & rods can only be applied because of its size the the patient's size... after the age of 9y) |

**Types of surgery:** مو معكم تفاصيل العمليات بس الأعمار متى نسوي عملية

| | |
|---|---|
| > 9m old | • Soft tissue release. postero-medio-lateral tendon release. Posterior: achilles tendon Z plasty hemicut → long cut → hemicut → then connects the 2 ends together (it gives longer tendon)  |
| > 3y old | • Bony Try to delay or avoid bone as much as we can to not affect growth<br>➔ Forefoot adduction cuboid larger than normal so do wedge in cuboid and then we do medial cuneiform osteotomy and put that wedge there  |
| >10y old | • Salvage: "regain appearance"If severe & rigid → arthrodesis:<br>In artholesis we eliminate subtalar and midfoot joint → the foot becomes like one piece of bone, Ankle joint still there so can do propagation walking, but no eversion and inversion anymore<br>• Triple osteotomy (talus – calcaneus – navicular), most common salvage procedure |

### 💀 Toronto Notes:

#### Congenital Talipes Equinovarus

⟹ **Epidemiology**

- 1-2/1,000 newborns,
- 50% bilateral
- Occurrence in Males more than Females
- severity in Females more than Males

⟹ **Etiology**

- Intrinsic factors: Neurologic, muscular, or connective tissue diseases
- Extrinsic factors: intrauterine growth restriction
- Idiopathic
- Neurogenic
- Syndrome-associate

# Deformities seen in cerebral palsy patients

## What is Cerebral Palsy (CP)?

★ A non-progressive "At 1 time" brain insult that occurred during the **perinatal** period. Immature brain <2 yo
- Perinatal = around delivery
  - ➢ Just before delivery = intrauterine fetal distress = abruptio placenta
  - ➢ During delivery = cord around the neck
  - ➢ Just after delivery = jaundice: bilirubin cross BBB causing **kernicterus**

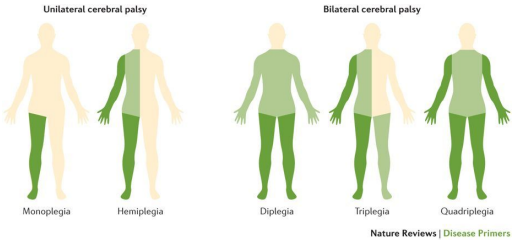
★ Causes skeletal muscles imbalance that affects joints' movements. Muscle balance of flexors, extensors, adductors, abductors are lost ⟶ deformities

★ It's not-uncommon

★ depends on the area of brain affected and the amount of insult, severity ranges from simple presentation to completely bedridden

★ Can be associated with:
- ➔ Mental retardation (various degrees)
- ➔ Hydrocephalus and V.P shunt لازم تسألوا عنها "استسقاء" فيه أنبوبة و لا سووا له عملية منظار
- ➔ Convulsions

## Classification:

| Physiological | Topographic MCQ! |
|---|---|
| • **Spastic**: this is the commonest because it's an UMN lesion! spastic is the most important one because it **can be treated surgically**<br>• Athetosis continuous involuntary movement<br>• Ataxia injury in hindbrain<br>• Rigidity<br>• Mixed<br>- all the types except for spastic we cannot operate on ⟶ the results are unpredictable | • Monoplegia= 1 Limb<br>• Diplegia = Both but Lower limbs affected more than upper<br>• Paraplegia = only lower limbs. this is somewhat rare, it's usually diplegia<br>• Hemiplegia = Right or left<br>• Triplegia = 3 limbs<br>• Quadriplegia or tetraplegia = whole body is involved<br>  |

## Gait:

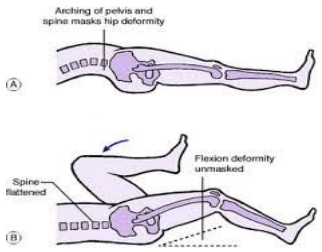
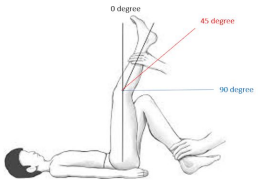
In-toeing: femoral anterversion & tibial torsion That's why we mentioned in-toeing that we have to examine the patient from head to toe, because it could be mild cerebral palsy "you may find also spasticity"

Scissoring Severe hip adduction result in scissoring, seen by Pediatric neurologist which refer child to ⟶ Physiotherapy ⟶ they can't continue gait training bc of severe scissoring, so they contact ⟶ Pediatric orthopedics to do tendon elongation

Crouch flexed hip - flexed knee - equinus

## Clinical Picture:

| Type | Level | Deformity | Picture |
|---|---|---|---|
| Upper limbs in hemiplegia | Wrist | - Flexion |  |
| | Elbow | - Flexion[8] | |
| Lower limbs in other types in spastic diplegic | Hip | - Flexion[9]<br>- Adduction[10]<br>- Internal rotation |   |
| | Knee | - Flexion[11] | |
| | Ankle | - **Equinus**<br>- Varus or valgus | |

| | Examination MCQ! |
|---|---|
| Hip | ★ Thomas test: tests if there is anterior hip flexion contracture or not bc if there is flexion contracture of the hip joint and I bring the thigh down on the bed → exaggerating of lumbar lordosis (they are connected to each other) so for me to assess the hip joint properly, I have to eliminate lumbar spine as a cause of contracture. I put my hand behind patient's back in the lumbar spine area and we sense excessive lumbar lordosis. Then we flex one knee until I feel the whole spine pressing on my hand "straight back" then we assess the hip flexion "with hip flexion the lordosis is eliminated"<br>★ Range of motion: to examine hip adduction and internal rotation   |
| Knee | ★ popliteal angle<br>flex the hip 90 degrees and see the maximum extension of knee,<br>if the child can extend it completely then the degree of flexion will be = 0<br>Normally we accept 10-15 degree flexion مع سوء اللياقة , but here they may reach 70-90 degrees so they are walking while their knees are flexed   |
| Ankle | ★ Achilles tendon shortening<br>To measure if it's tight or no we flex the knee then we extend "dorsiflex" the ankle. Normally we can but if the achilles tendon is tight it will go into equanus  |

[8] Flexors are stronger than extensors
[9] Flexors are stronger than extensors
[10] Adductors are much stronger than abductors
[11] Hamstrings are much stronger than quadriceps

## Treatment: MCQ!

### ➢ Multidisciplinary

- ★ Pediatric neurology → diagnosis, Follow up, treat fits
- ★ **Physiotherapy** (home & center) → joints R.O.M, gait training
- ★ Orthotics maintain correction, aid in gait they give them ankle foot orthosis to wear while they're sleeping
- ★ Social / Government aid

### ➢ Others:

- ★ Neurosurgery (V.P shunt)
- ★ Ophthalmology (eyes squint)

## Orthopedic surgery:

### ➢ Indications of Orthopedic surgery:

- ★ Severe contractures preventing physiotherapy we never intervene unless the physiotherapy say so
- ★ physiotherapy plateaued due to contractures
- ★ Perennial hygiene (sever hips adduction) adductor tenotomy + obturator neurectomy in non walkers
- ★ In a non-walker to sit comfortably in wheelchair
- ★ Prevent:
  - Neuropathic skin ulceration (as feet) → Once the skin is gone → osteomyelitis. Sometimes we correct the feet not for function "non-walker" but for cosmosis and to prevent complications.
  - Joint dislocation (as hip) with sever adduction over time

### ➢ Options of Surgery:

- ★ Tendon elongation
- ★ Tendon Transfer tibialis anterior
- ★ Tenotomy non walker
- ★ Neurectomy in hips
- ★ Bony surgery: supramalleolar Osteotomy → in severe intoeing
  Fusion: if with time caused deformity or joint fusion

★ **Keep in mind!**

- P.T should be as fun & games
- Being a quadriplegic does not mean they can not walk or can not get a colleague degree
- Give them a chance, support them, let them enjoy their lives