Pediatric Orthopedics: ``To Refer or Not to Refer``

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- No conflict of interest to disclose

Objectives

- Understand the difference between hip clicks, hip instability and indications for hip ultrasound.
- Differentiate between physiological and pathological causes of intoeing, bow legs, knock knees and flatfeet.
- Differentiate between adolescent anterior knee pain and other knee pathologies.

- Understand the difference between hip clicks, hip instability and indications for hip ultrasound.

The Newborn Hip: When to Refer

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History

- The 4 “**F**’s”

History

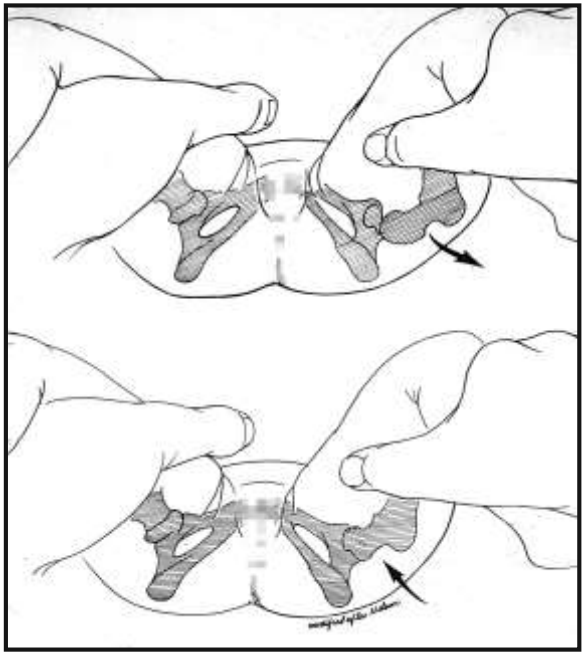
- First born
- Female (13:1)
- Frank breech (hips flexed, knees extended)
- Family history

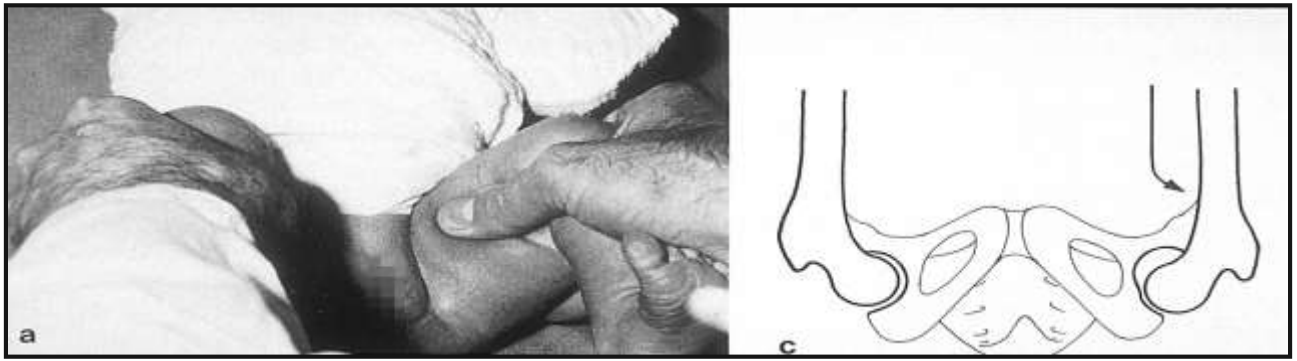
Physical Exam

- Baby must be relaxed
- If crying, examine hip later
- Gentle exam

Physical Exam

Barlow – dislocate reduced hip

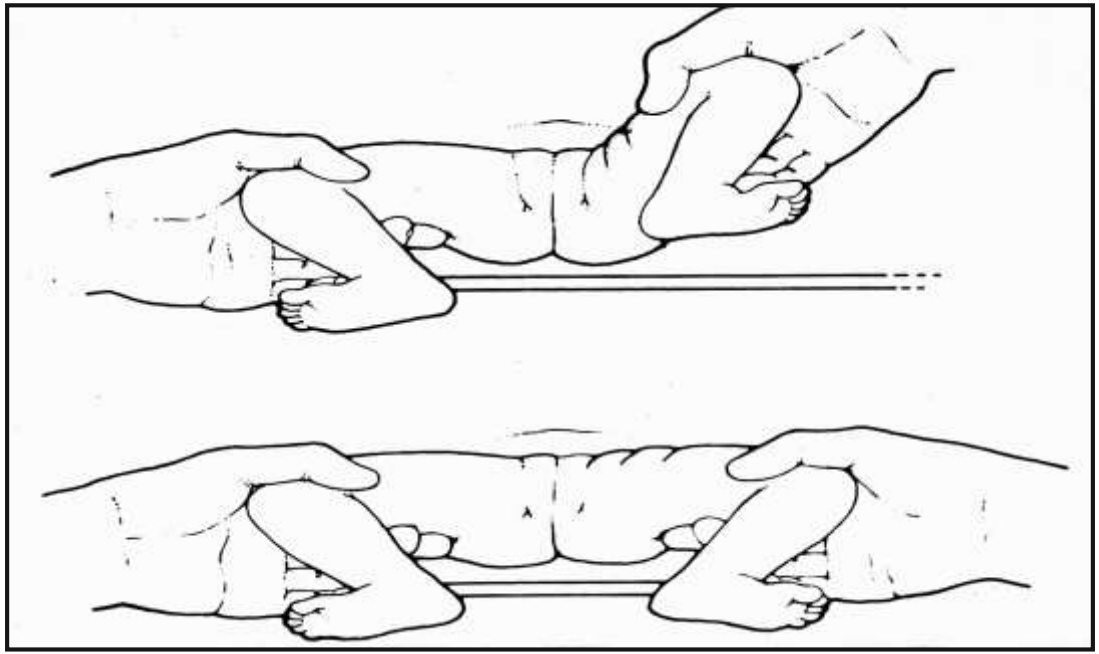


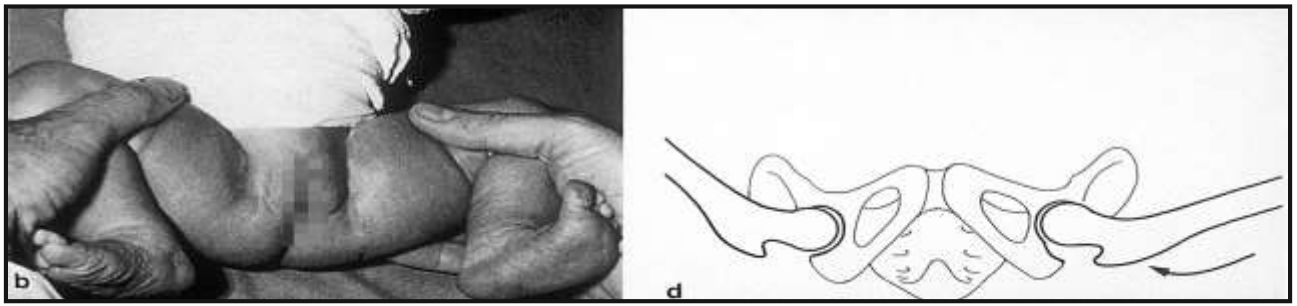

a
c

Physical Exam

Ortolani $^{+ve}$ – reduce a dislocated hip

Ortolani $^{-ve}$ – not able to reduce a dislocated hip




b
d

Physical Exam

Click:

- Benign
- Not a “clunk”
- No significance

Physical Exam

Barlow, Ortolani → up to 4 – 6 weeks of age

Click → up to 4 – 6 months of age

Physical Exam

If dislocated hip not picked up by 4 – 6 weeks of age then generally lose Barlow, Ortolani manoeuvre.

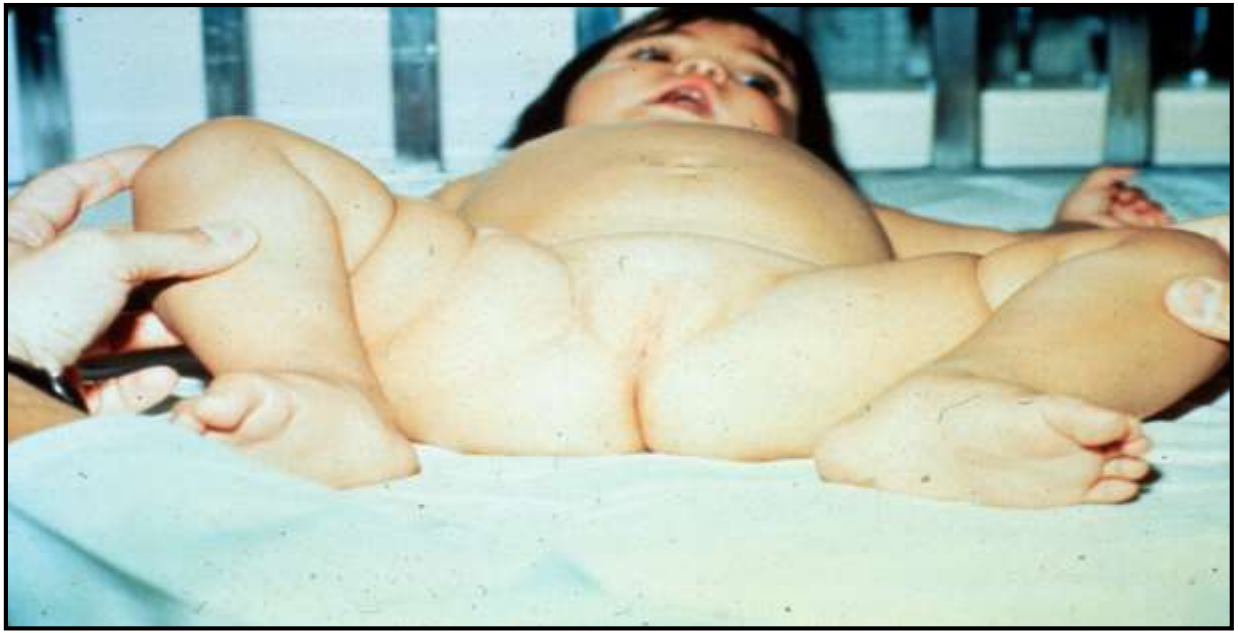
↓

Late physical signs of dislocated hip appear, but only by 4 – 5 months of age.

Physical Exam - Late Signs

Decreased hip abduction

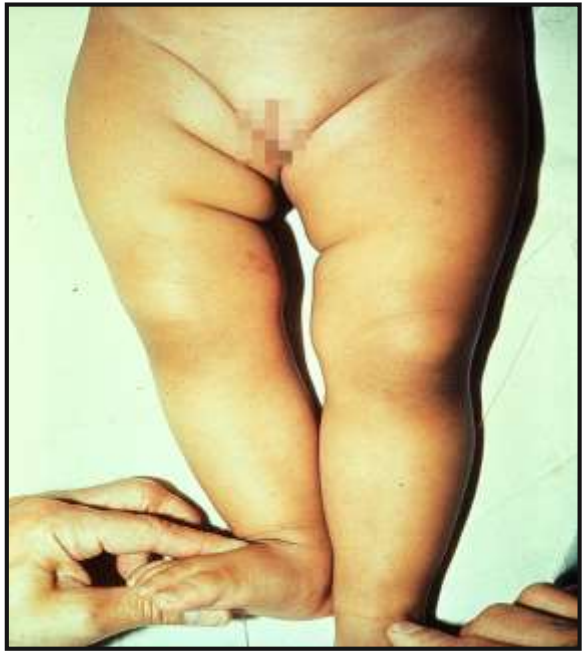
Limitation of abduction



Physical Exam - Late Signs

Apparent short leg - Galeazzi sign

asymmetrical thigh folds



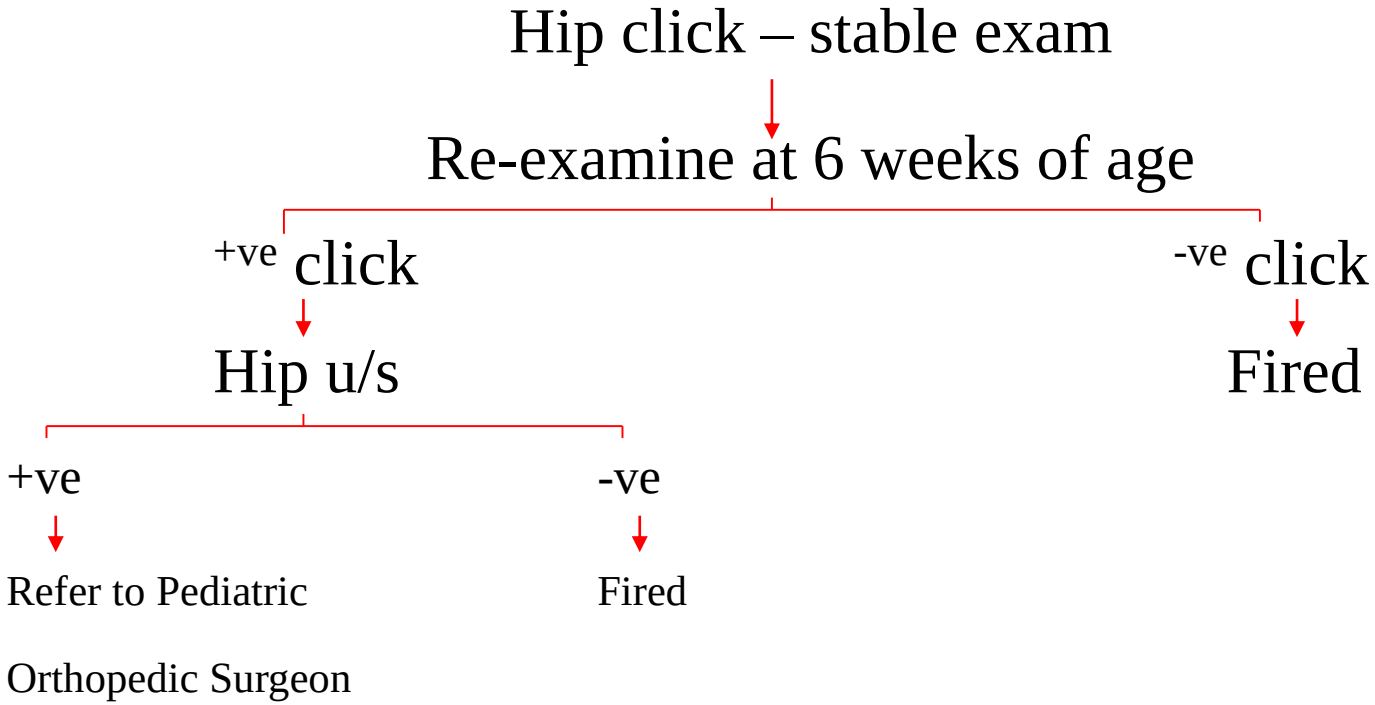
Bottom Line

Detect unstable hip (Barlow, Ortolani)

↓

Refer to pediatric orthopedic surgeon

Bottom Line


Hip click – stable exam
Re-examine at 6 weeks of age
+ve click
-ve click
Hip u/s
Fired
+ve
-ve
Refer to Pediatric
Orthopedic Surgeon
Fired

Grey Area
6 weeks to 3 – 4 months

- Too late to detect reducibility (absent Ortolani, Barlow)
- Too early to detect late physical signs (decreased abduction, LLD)

Bottom Line
Grey Area

- If exam does not “feel right”
- Breech or family history

↓

Send for hip ultrasound at 6 -8 weeks

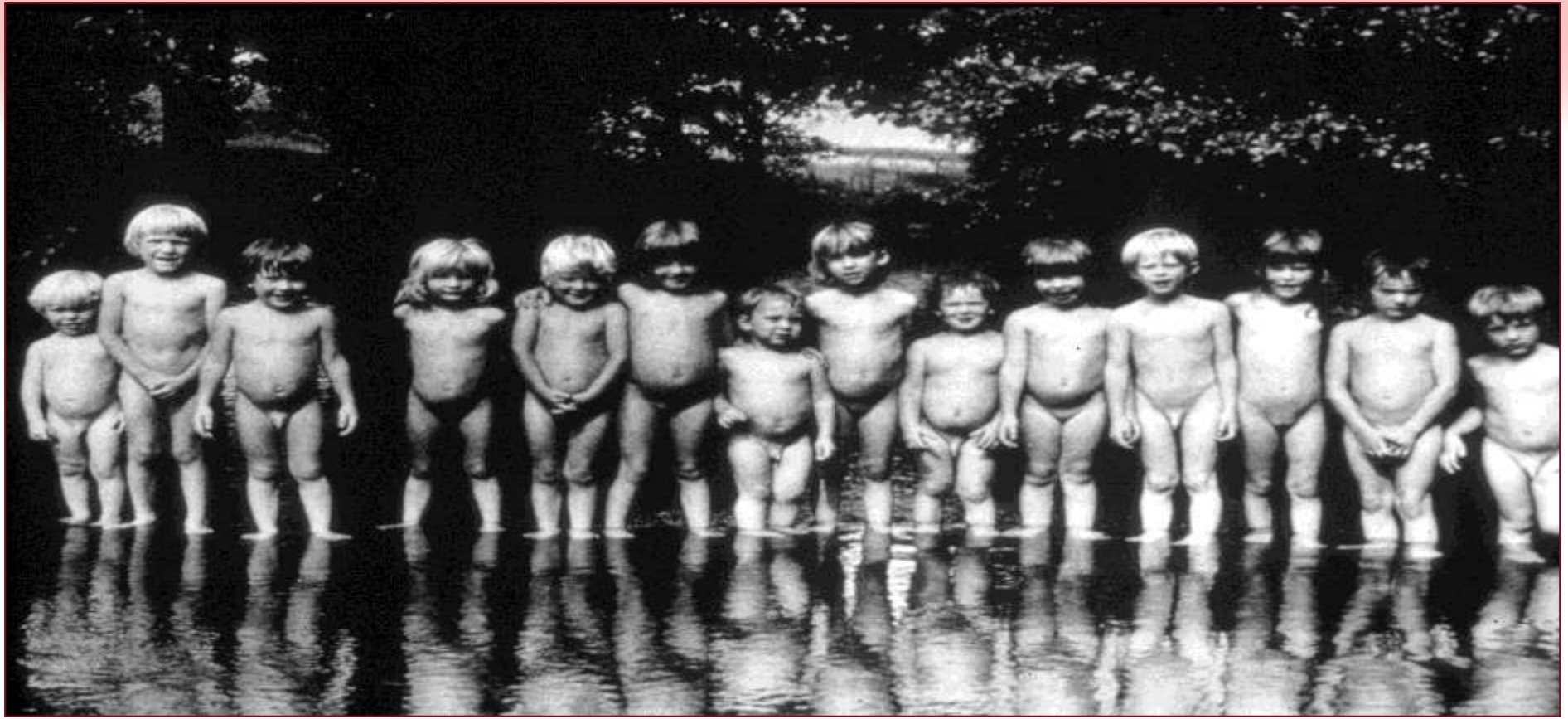
No Need to Refer

- Hip click
- Extra skin crease/fold

↓

- Provided hip exam is normal

- Differentiate between physiological and pathological causes of intoeing, bow legs, knock knees and flatfeet.



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Intoeing Objectives

- Anatomical
- Chonological
- Refer?

Intoeing

(i) Hip/Femur - Femoral Anteversion

(ii) Tibia – Internal Tibial Torsion

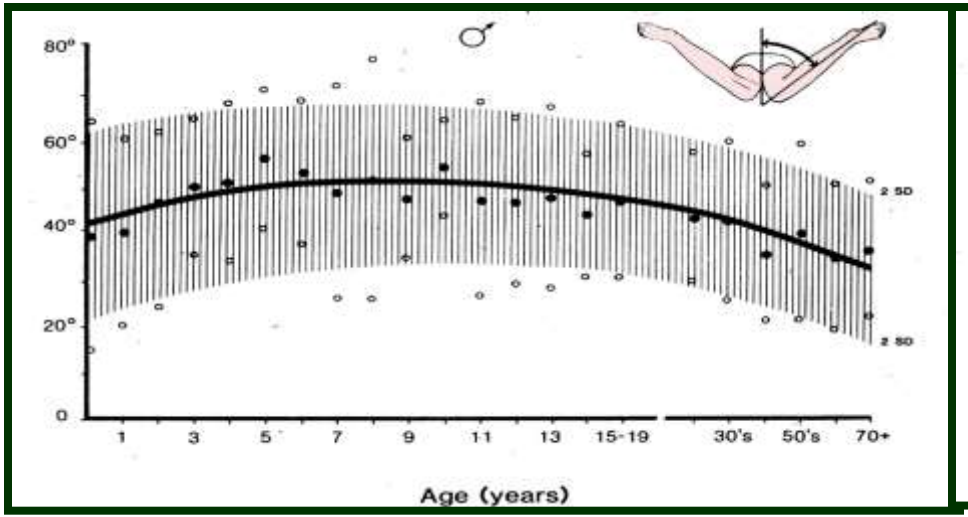
(iii) Foot - Metatarsus Adductus
or combination

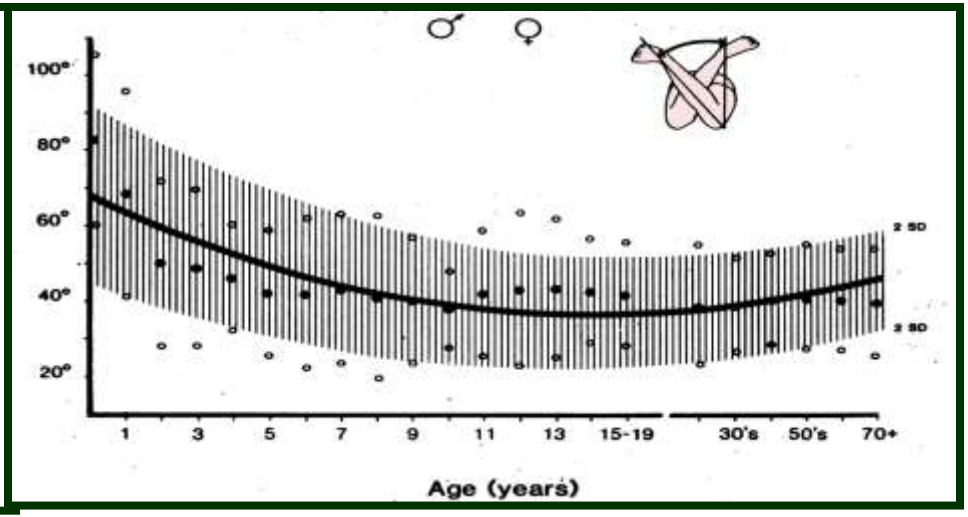
H & P

- Birth history
- Gait
  - Symmetrical
  - Toe walking
  - Run
  - Hop
  - Hip exam
  - Leg exam
  - Foot exam
- Neuro

Femoral Anteversion

- ↑ Hip internal rotation
- ↓ Hip external rotation
- Female
- Age: ~ 3 - 10





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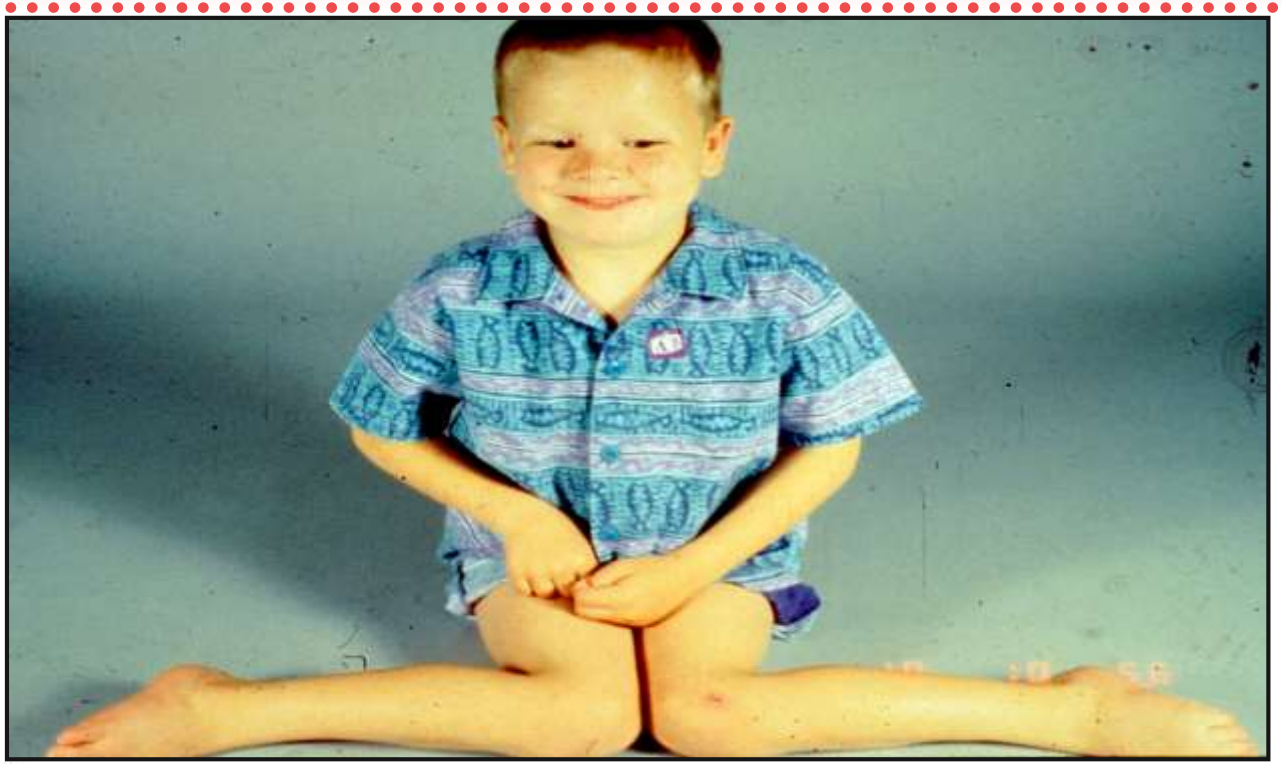
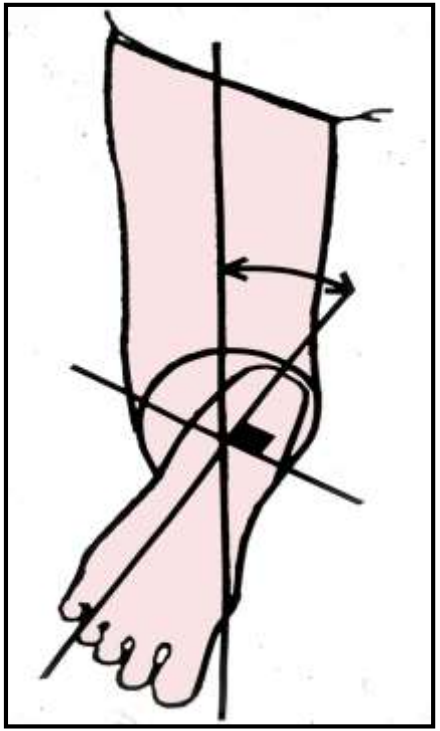


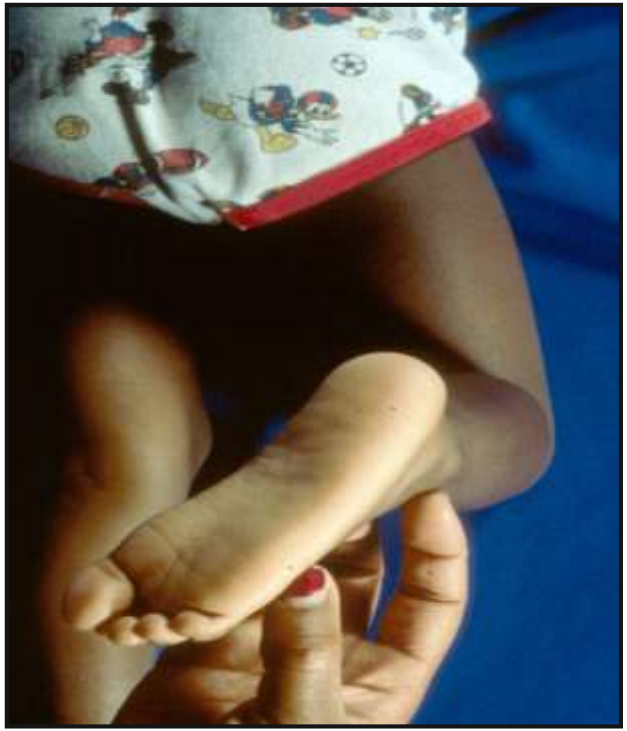
Femoral Anteversion

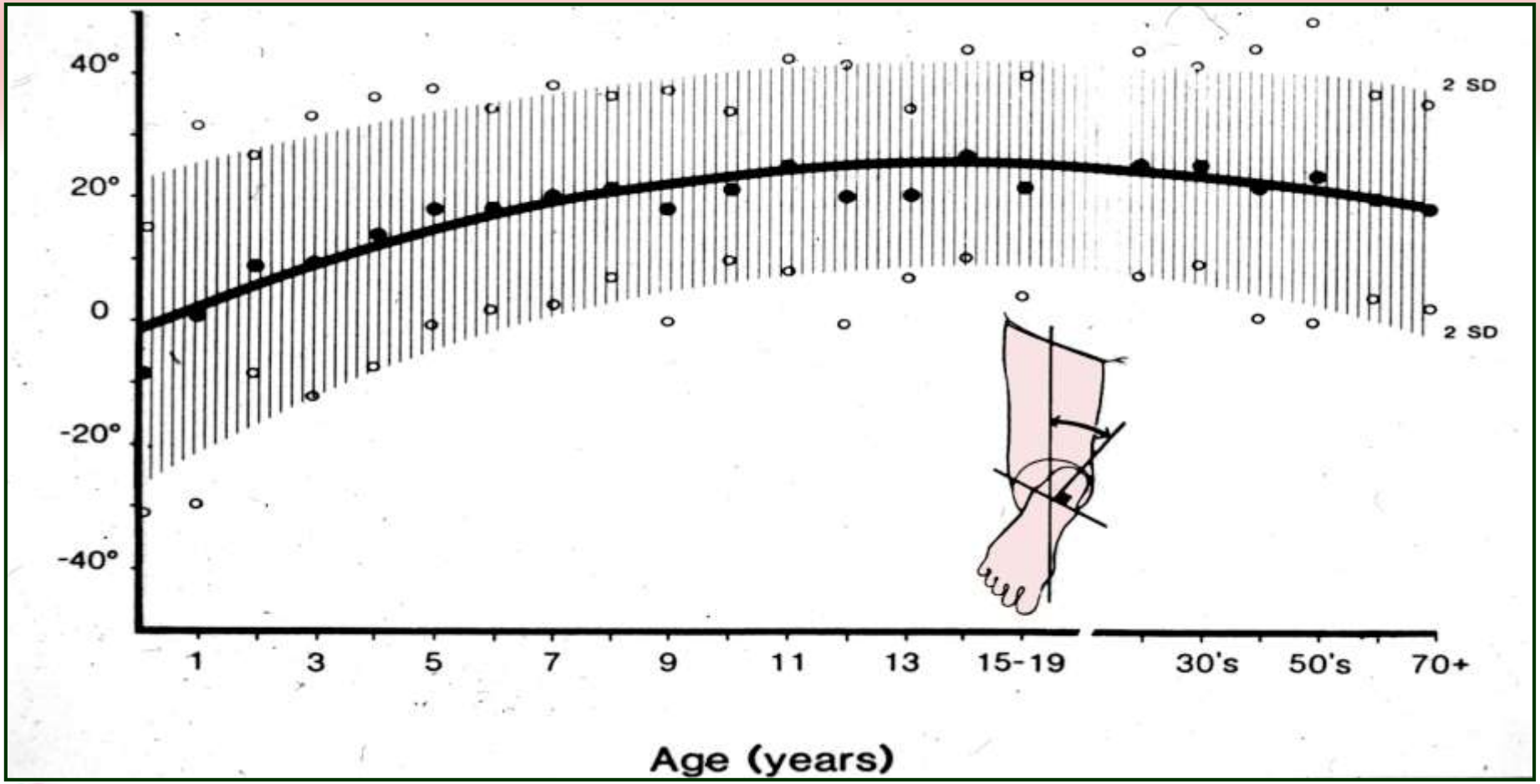
- Most cases of femoral anteversion will remodel by age 10 unless mom and dad still have it
- Cosmetic concern only
- No functional implications in later life!!!
- Therefore, NO treatment

Internal Tibial Torsion

Most common cause of intoeing < 3 yrs of age





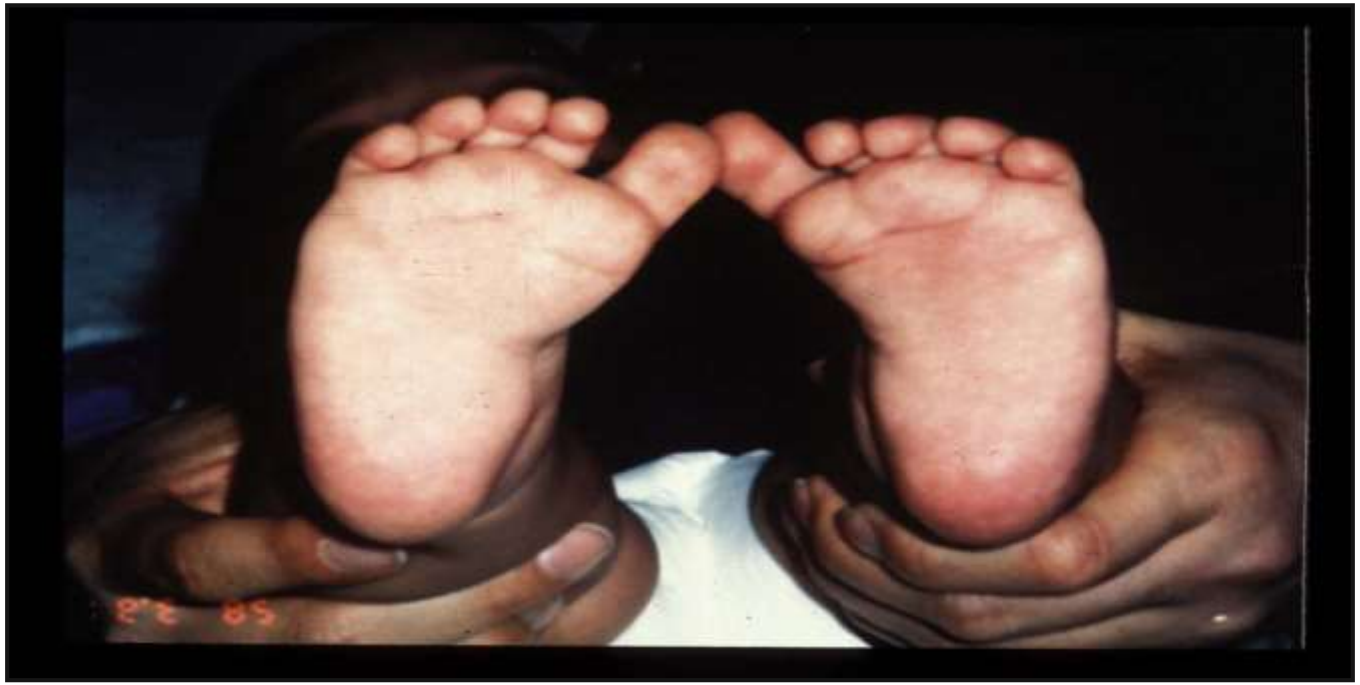

40°
20°
0
-20°
-40°
2 SD
2 SD
1
3
5
7
9
11
13
15-19
30's
50's
70+
Age (years)

Internal Tibial Torsion

- Usually symmetric
- Most cases will remodel by age 4
- May be associated with femoral anteversion
- Cosmetic concern
- No functional implications

Metatarsus Adductus

- 0 – 18 months
- Forefoot pointing in
- Intrauterine fetal position
- Most respond to time, stretching, or casting
- Must differentiate from clubfoot (where hindfoot is malpositioned and foot very stiff)



Metatarsus Adductus

Refer:

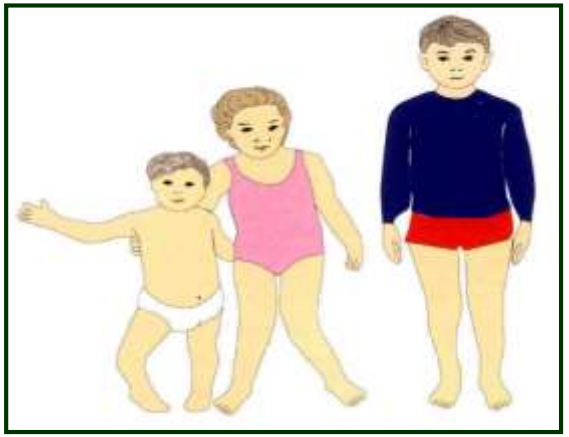
- Not flexible
- Very curved lateral border
- Deep medial crease
- < 8 months of age

Intoeing Summary

Refer:

- Very asymmetrical
- Abnormal physical examination
  - ↑ Tone
  - Clonus
  - Hyperreflexia
- Foot – Deep medial crease and rigid

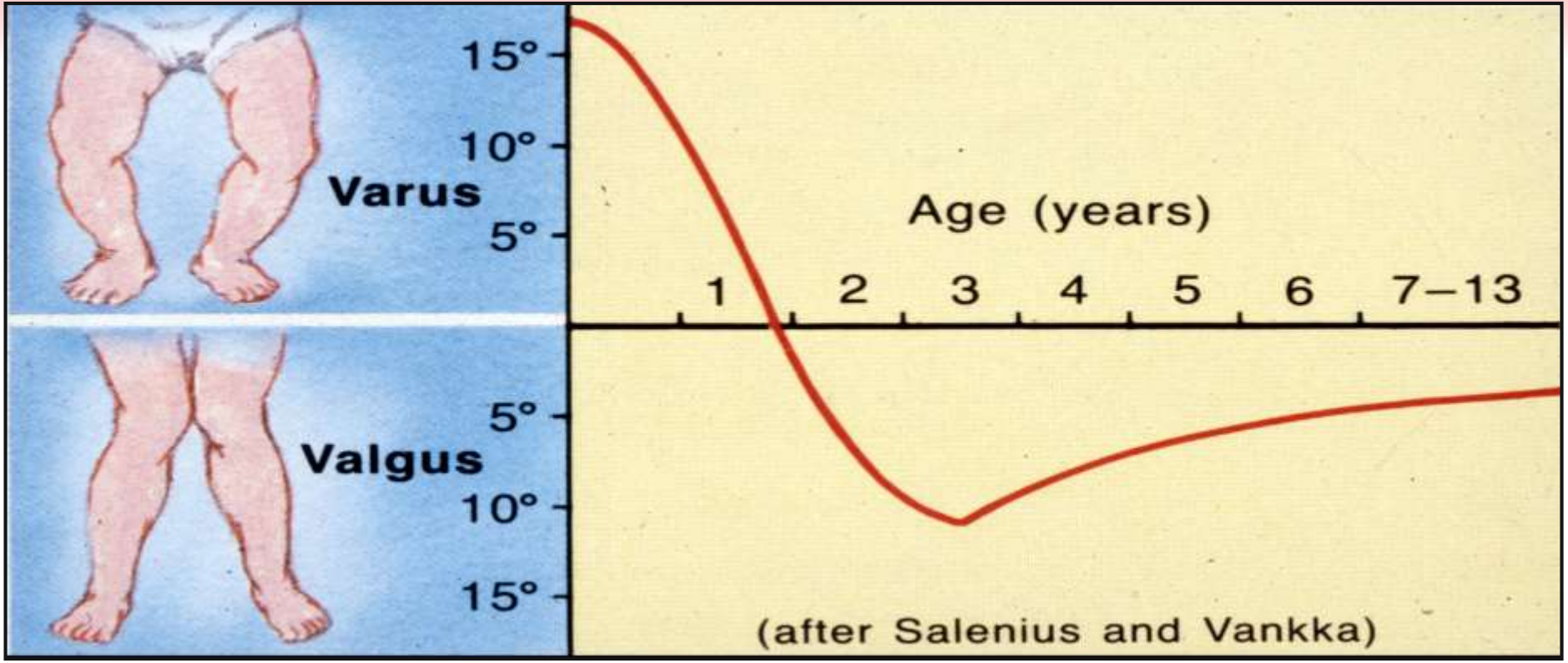
Angular Deformities in Children



Bowlegs = Genu Varum

Knock knees = Genu Valgum

- Usually physiological, needs no treatment
- But… do not miss pathological causes
- How to differentiate physiological from pathological angulation in children?


15°
10°
5°
Varus
Age (years)
1
2
3
4
5
6
7–13
5°
Valgus
10°
15°
(after Salenius and Vankka)

Approach to a Child with Angular Deformity

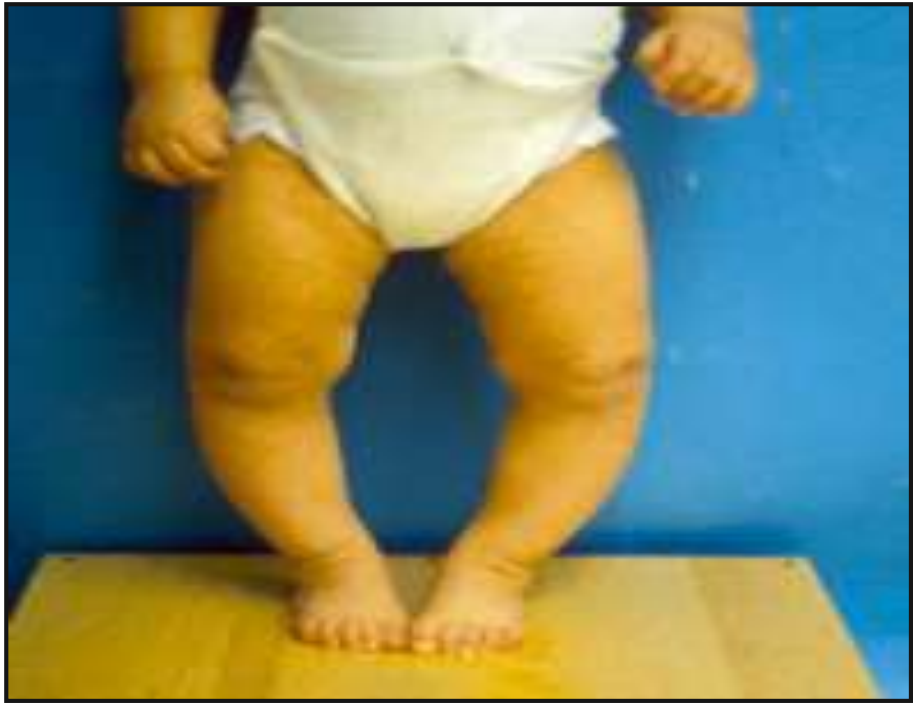
- Family history
- History of present condition
  - Progression
- Physical examination:
  - General (features of skeletal dysplasia)

Clinical Evaluation

- No evidence of pathological bone disorder
- Age of the child
  - Genu Varum = 1 – 3 years
  - Genu Valgum = 3 – 7 years

Therefore, it is physiological – you do not need to refer the patient

- Follow-up appointment
- Clinical photographs



18 months

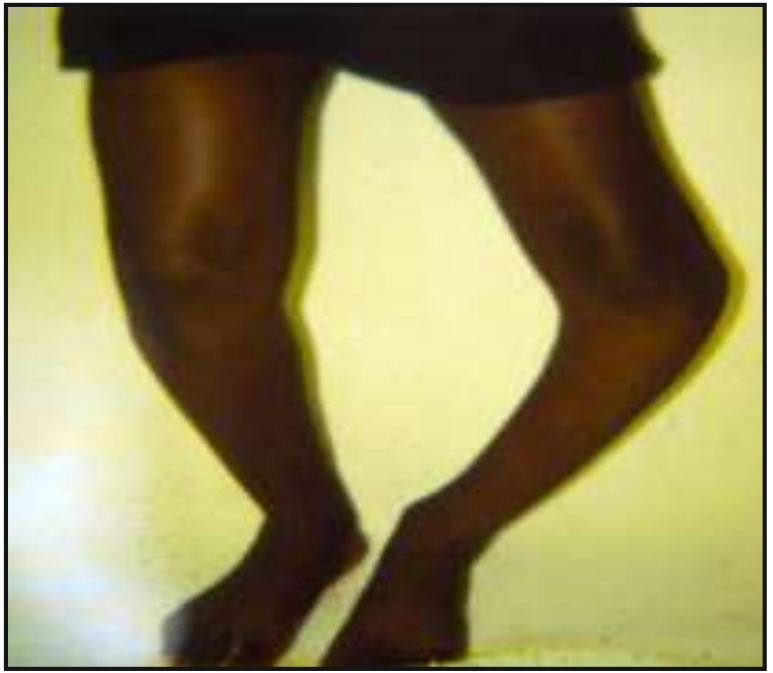
4½ years old

When should you refer a child with angular deformities?

- Deformities falling outside the age for physiological genu varum and valgum

When should you refer a child with angular deformities?

- Unilateral



When should you refer a child with angular deformities?

- Asymetrical

When should you refer a child with angular deformities?

- Severe

When should you refer a child with angular deformities?

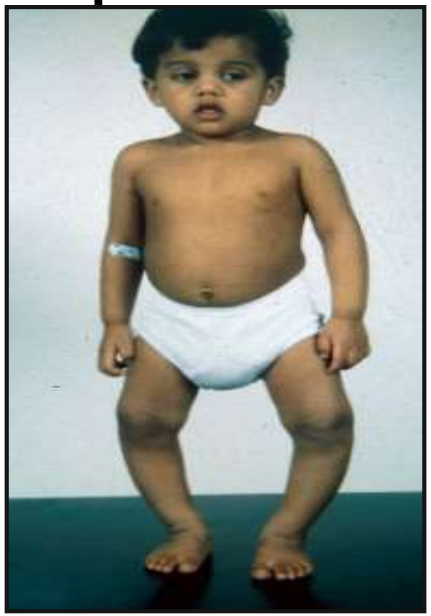
- Progressive

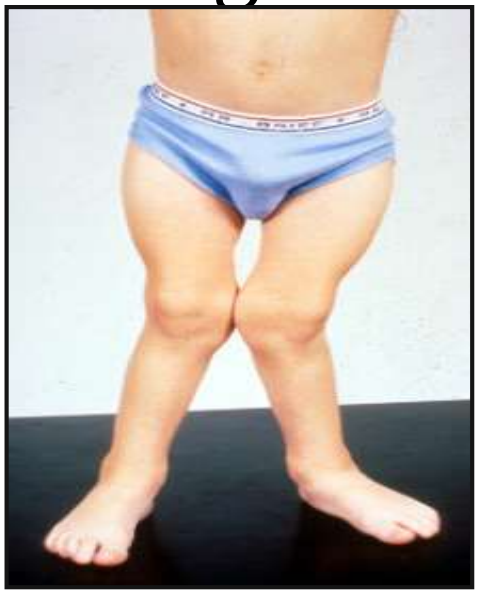
18 months

4 years old

When should you refer a child with angular deformities?

- Any suspicion of pathological disorder

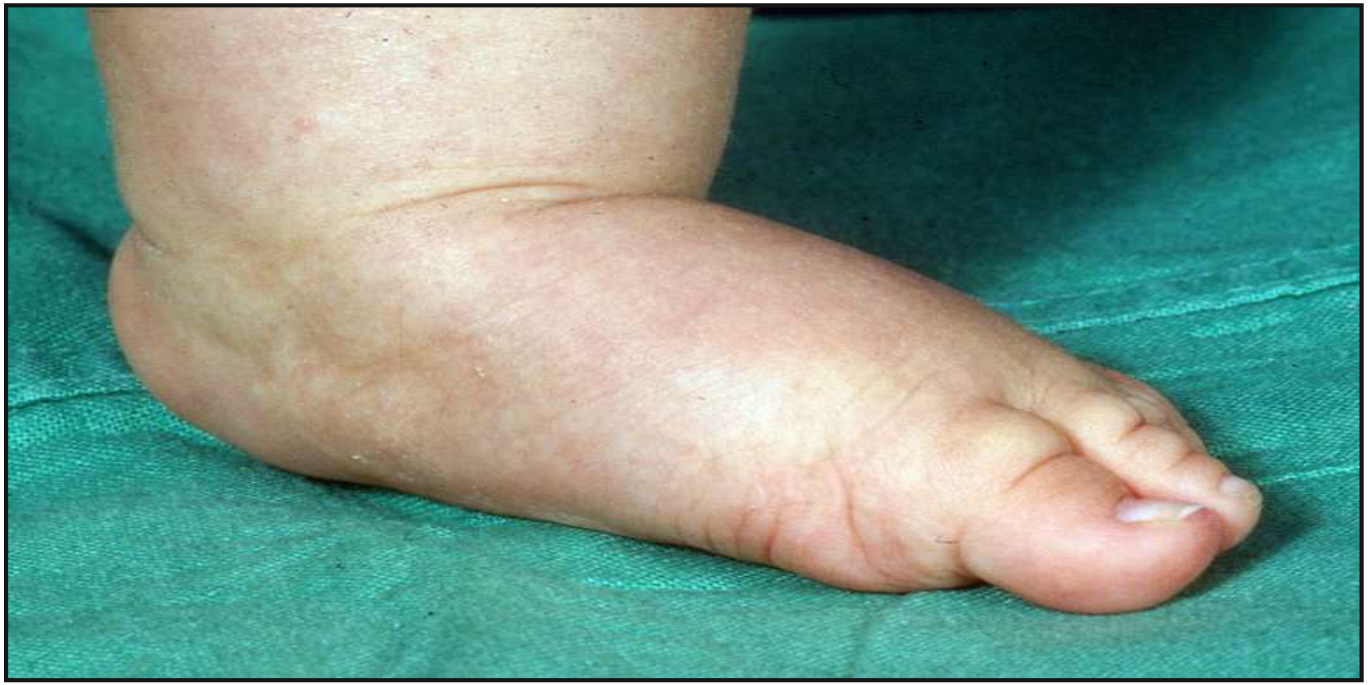




When should you refer a child with angular deformities?

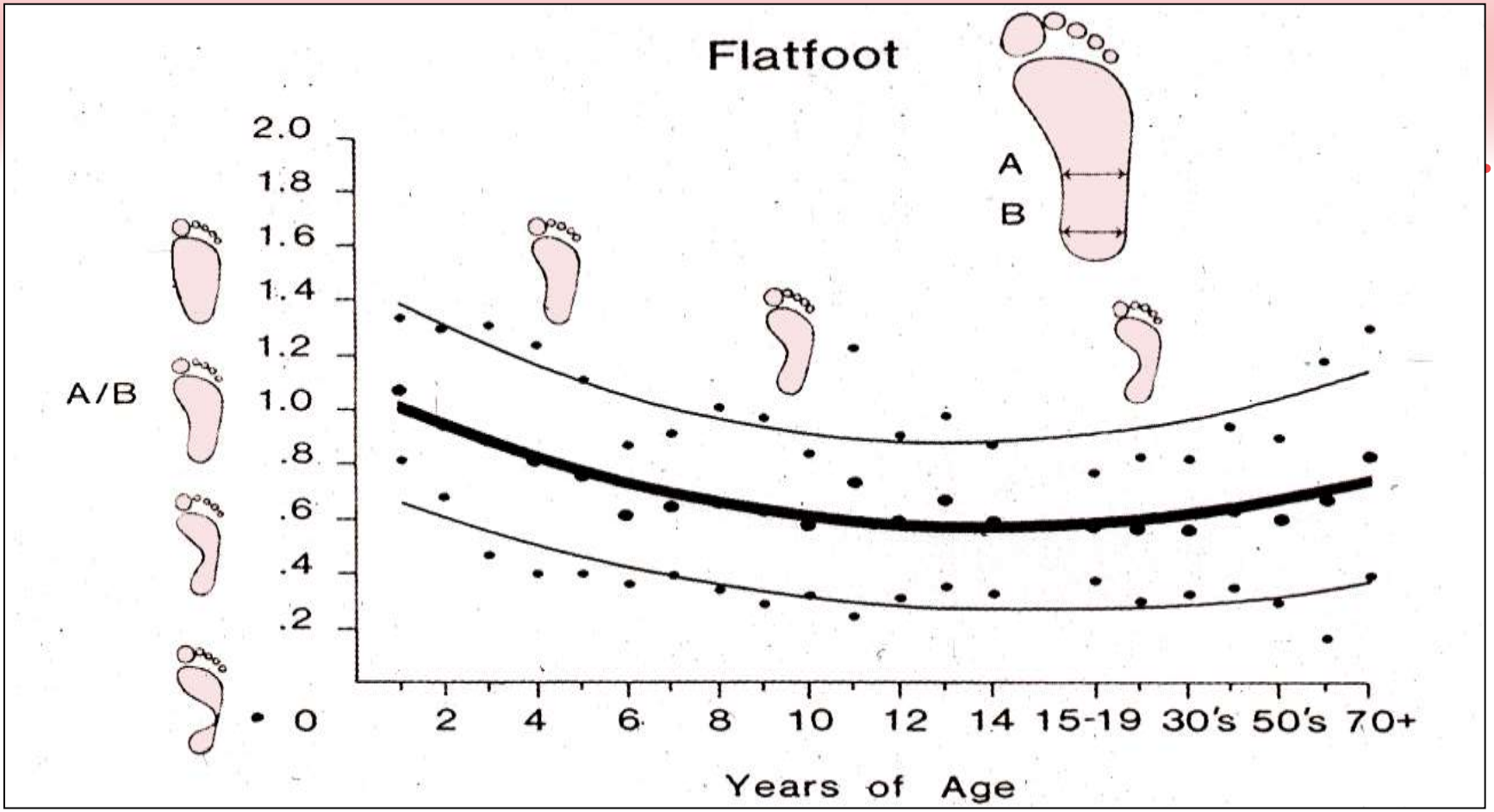
- Deformities falling outside the age for physiological genu varum and valgum
- Unilateral
- Asymetrical
- Severe
- Progressive
- Any suspicion of pathological disorder

Flatfeet



Flatfeet

- Most always asymptomatic
- No correlation to back pain
- Major source of concern to parents


Flatfoot
A
B
A/B
2.0
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
2
4
6
8
10
12
14
15-19
30's
50's
70+
Years of Age

Corrective Shoes and Inserts as Treatment for Flexible Flatfoot in Infants and Children*

BY DENNIS R. WENGER, M.D.†, SAN DIEGO, DONALD MAULDIN, M.D.‡, GAIL SPECK, M.D.‡, DEAN MORGAN, C.PED.‡, DALLAS, TEXAS, AND RICHARD L. LIEBER, PH.D.†, SAN DIEGO, CALIFORNIA

From the Texas Scottish Rite Hospital, Dallas, and the Division of Orthopedics, University of California at San Diego, San Diego

Flatfeet

- Rigid vs flexible
- Painful
- Reforms arch with NWB
- ST joint mobility

Different Dx of Painful Rigid Flatfeet

- Tarsal coalition – unilateral or bilateral
  - 8 – 14 years of age
  - Mechanical/no history of trauma
- JRA - bilateral
- Infection - unilateral
- Trauma - unilateral

Refer:

- Painful → flexible or rigid

Do not refer:

- Not painful, even if rigid
- Arch supports

Toe Walking

History

- > 3 years of age
- Perinatal history/develpment
- Family history
- Timing
- % of time on toes

Physical Exam

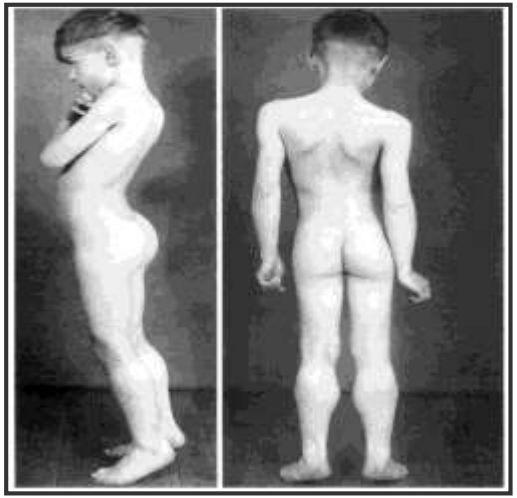
- Calf hypertrophy
- Gower sign
- Clonus, hyperreflexia
- Spine
- Squat test

- Ankle DF to be assessed with knee in EXT.

DF= -20°

DF= 0°

- DDx:
  - Cerebral palsy
  - Muscular dystrophies
  - Tethered cord syndrome
  - Diastematomyelia
  - Other neuromuscular diseases
  - Autism



TREATMENT:

Any *ANOMALY* on exam → **REFER**

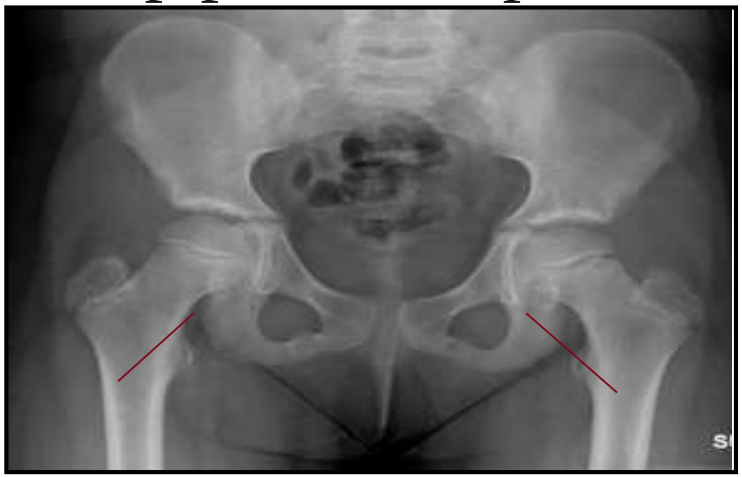
- If left untreated, will persist or worsen
- Modalities:
  - Physio: Stretching
  - Night braces
  - Serial casts and Botox
  - Surgery

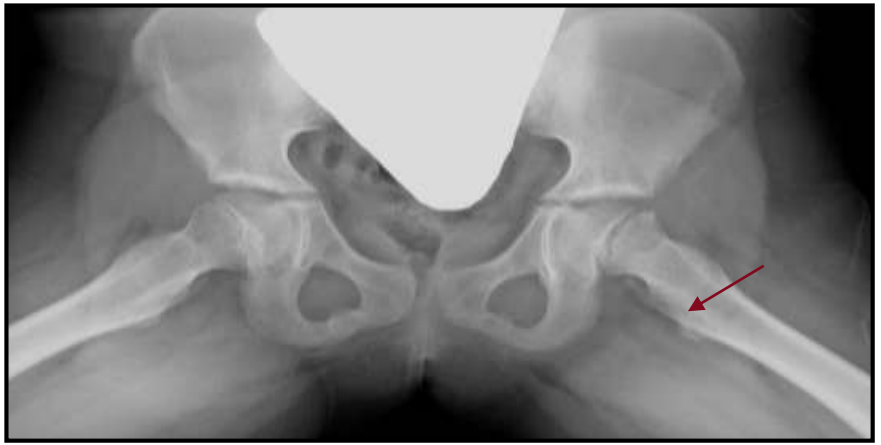
- Differentiate between adolescent anterior knee pain and other knee pathologies.

ADOLESCENT KNEE PAIN

Any red flags?

Knee pain in skeletally immature patient = referred hip pain until proven otherwise

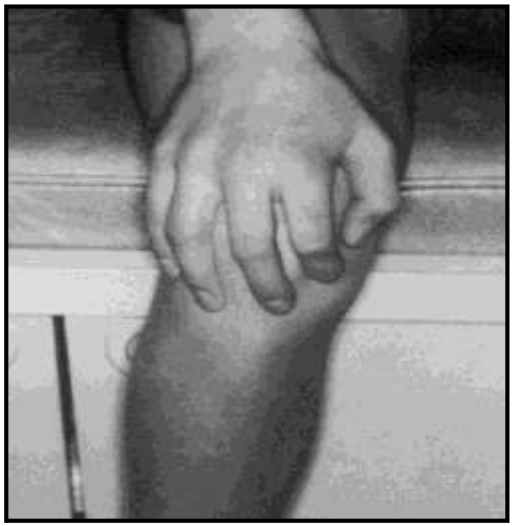




Anterior Knee Pain

HISTORY:

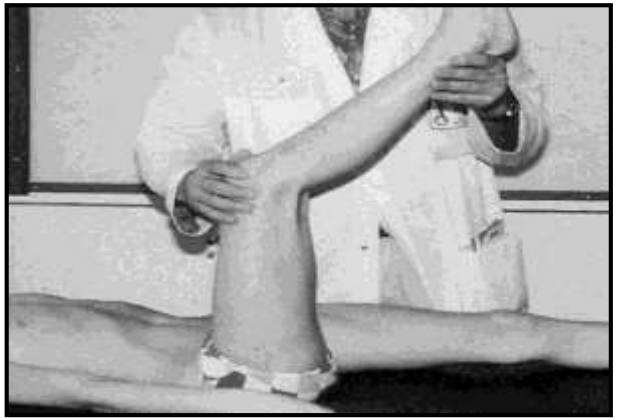
- ♀ 10 – 15 years of age
- Poorly localised
- Usually bilateral
- Grab sign
- associated with prolonged sitting, stairs, + theater sign
- Pseudolocking
- No history of trauma



Anterior Knee Pain

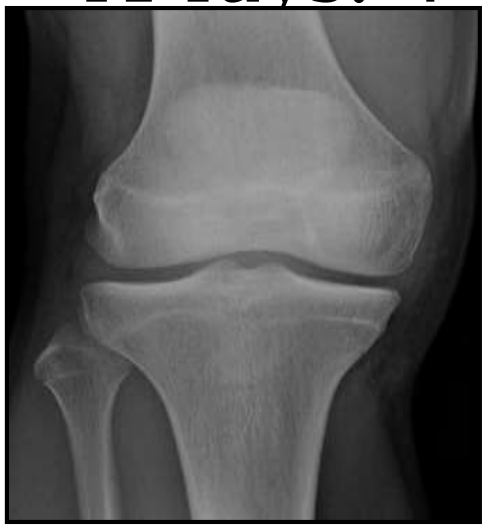
PHYSICAL EXAM:

- Tight hamstrings

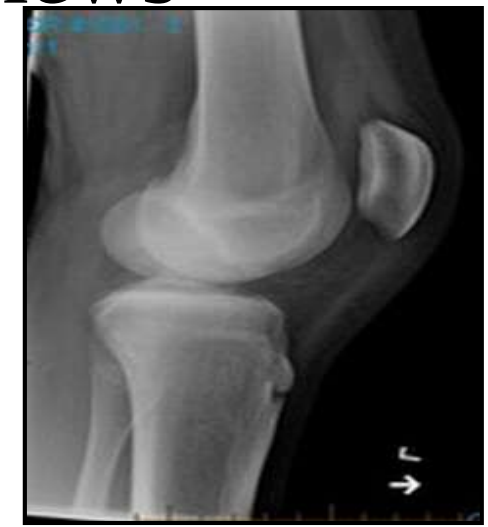


Anterior Knee Pain

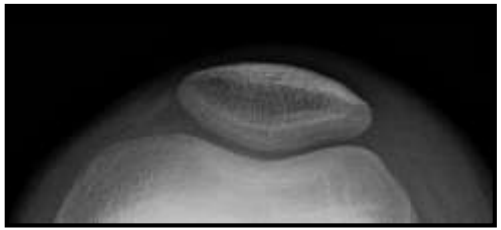
- X-rays: 4 Views



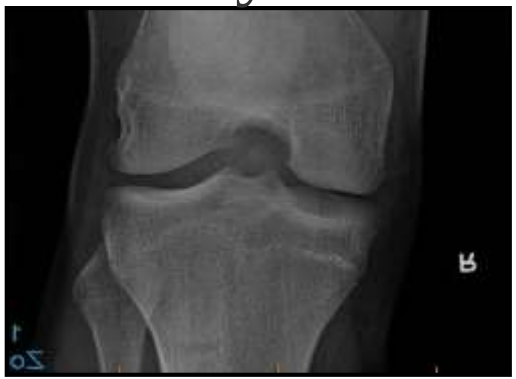
A/P



Lat



Skyline



Tunnel

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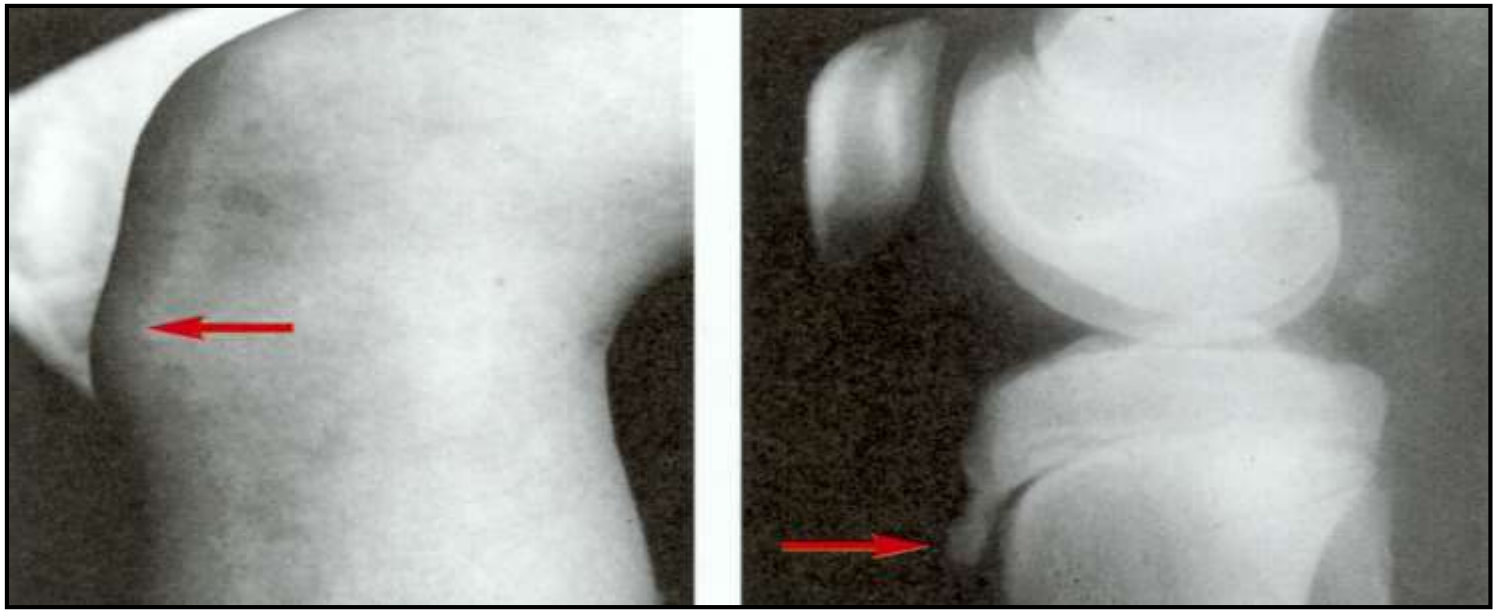
Anterior Knee Pain

TREATMENT:

- Physio: hamstring stretching
- Knee brace?
- Reassurance

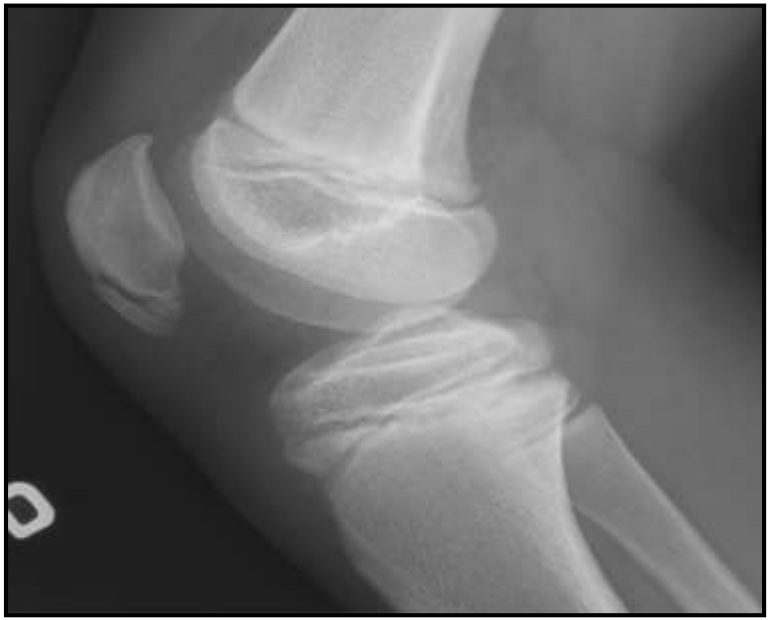
Anterior Knee Pain

- Osgood-Schlatter



Anterior Knee Pain

- Sinding-Larsen-Johansson



Red Flags

- History of trauma
- Unilateral
- Swelling
- Real locking
- Giving way
- Night pain → fever

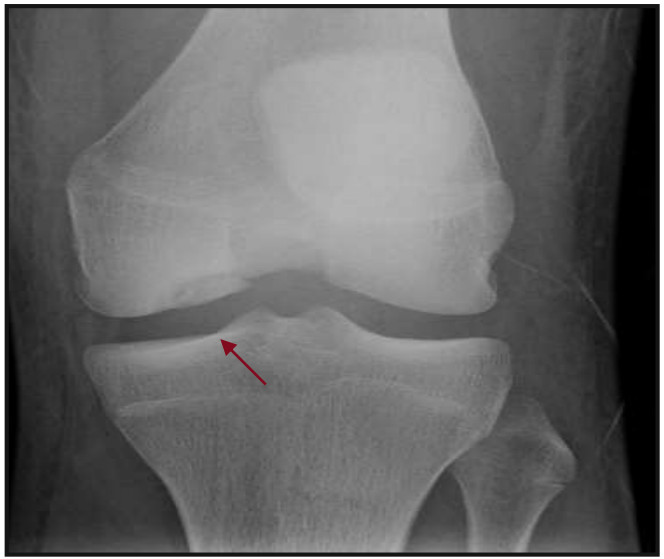
Red Flags

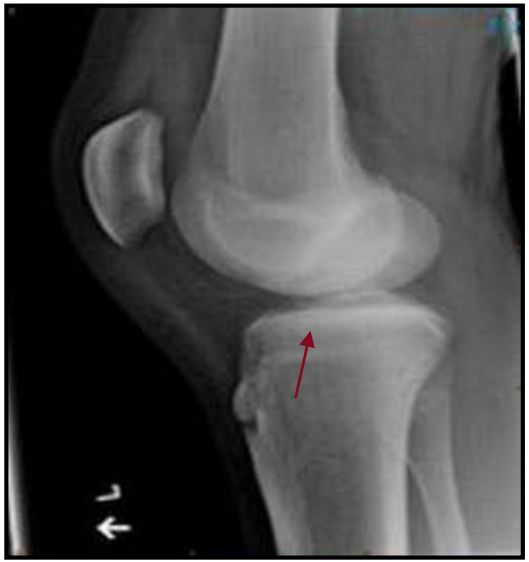
PHYSICAL EXAM:

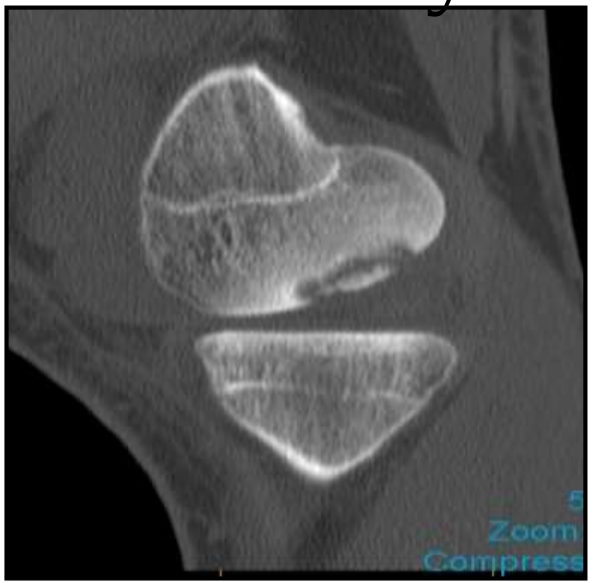
- Limping
- Quadricep atrophy
- Swelling
- Pain along joint line
- Abnormal hip examination

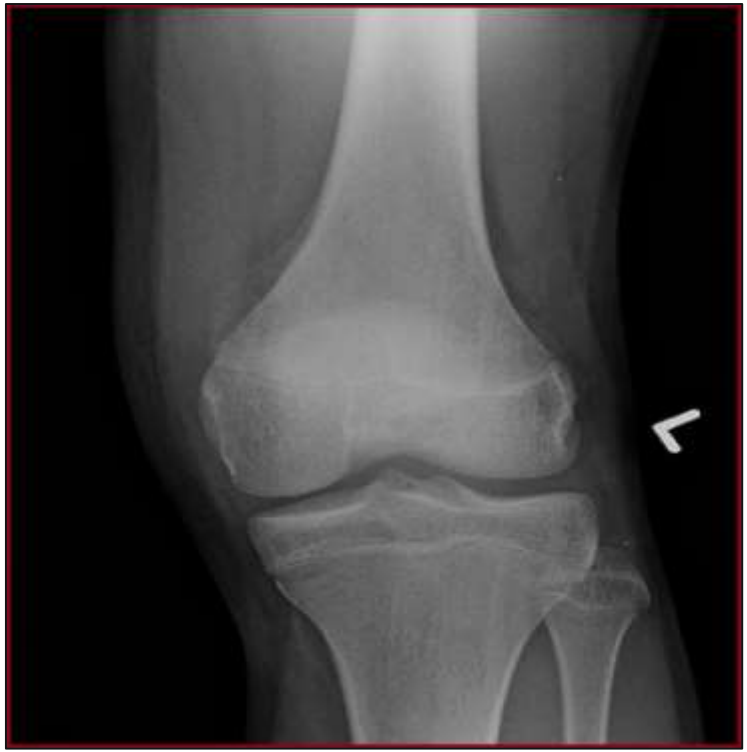
Red Flags

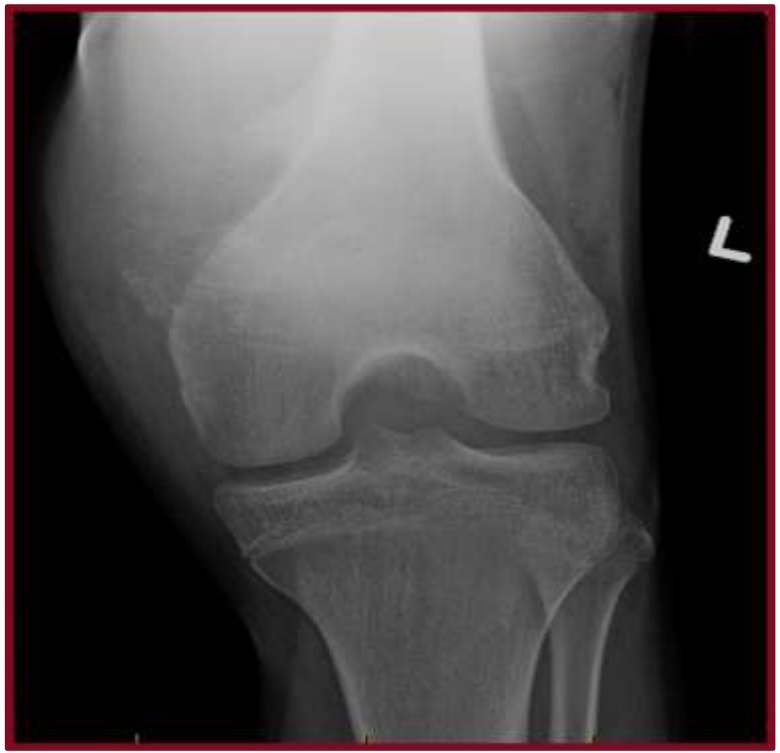
Osteochondritis Dissecans: Femoral Condyle







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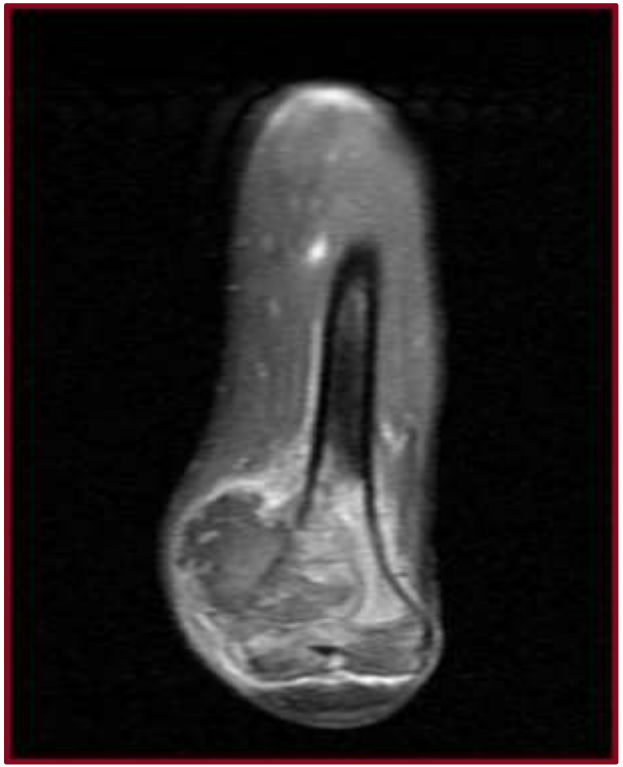

Moral Of The Story

- Unilateral knee pain should be taken seriously
- Do not be fooled by initial trauma in tumor cases

Thank you!

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