DELAWARE ACADEMY OF
FAMILY PHYSICIANS

The Limping Child

Julieanne P. Sees, DO, MBA, FAOAO, FAOA, FAAOS
Pediatric / Neuro-orthopaedic Surgeon
National Academy of Medicine / CVS Health

2023 SPORTS MEDICINE SYMPOSIUM

DISCLOSURE

- No disclosures

LEARNING OBJECTIVES

At the conclusion of this presentation the learner will be able to:

1. To identify common disorders: age is helpful
2. To know what to order: labs, X-rays, advanced imaging
3. To recognize when to refer for care in treatment of a child presenting with a limp

www.pinterest.com/pin/disney

Let’s Start

What to do for … the Child with a Limp?

Introduction: The Limping Child

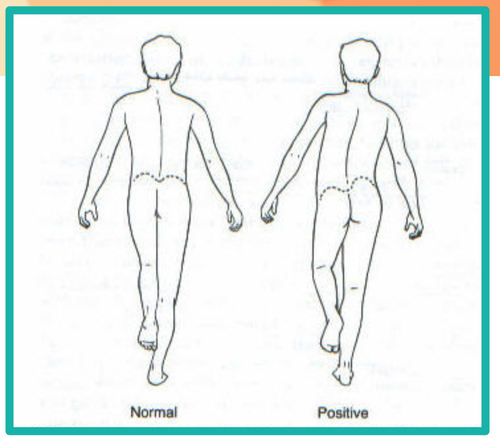
- Important approach
  - systematic manner
- Thorough H&P
- Inspect
  - joints: swelling, effusion, erythema, warmth
  - muscle atrophy, deformity, symmetry
- Note range of motion & pain
- Observe gait

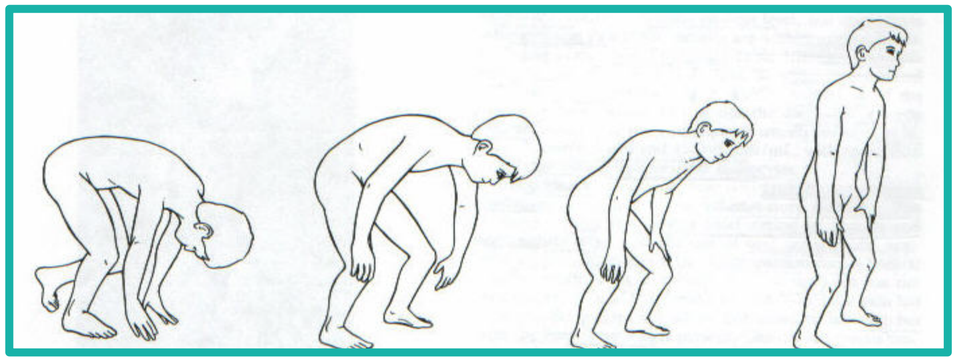
Limping in Various Age Groups

Toddler (1-3 years)	Child (4-10 years)	Adolescent (11+ years)
Transient synovitis	Transient synovitis	Slipped capital femoral epiphysis
Septic arthritis	Septic arthritis	Hip dysplasia
Diskitis	Legg-Calve- Perthes	Chondrolysis
Toddler's fracture	Discoid meniscus	Overuse syndromes
Cerebral Palsy	Limb length discrepancy	Osteochondritis dissecans
Muscle dystrophy		
Developmental Dysplasia		
Juvenile arthritis		
RARE: Leukemia		
Osteoid osteoma		

Abnormal Gait Patterns

- Antalgic gait
- Trendelenburg gait
- Proximal muscle weakness gait
- Spastic gait
- Short-limb gait





Antalgic Gait

- Caused by pain in LE or back (most common)
- Child takes quick, soft steps on the leg (“short-stepping”)
  - Reduces time of extremity in stance phase
  - Normal limb longer in stance phase
- If source is hip = lean toward affected side decreasing abductor force across the hip

Short-limb Gait

- Gait asymmetry:
  LLD > 3.7 to 5.5 cm

- Toe-walking:
  keeps pelvis level
  idiopathic
  neurologic

- Hip and knee flexion of longer extremity in stance

Inflammatory and Infectious Disorders

- Transient (Toxic) Synovitis
- Septic Arthritis
- Osteomyelitis
- Diskitis
- Pauciarticular Juvenile Arthritis

uk.movies.yahoo.com/inside-outs-official-character-descriptions

Transient (Toxic) Synovitis

- Most common cause of LE pain, often hx of antecedent viral illness
- Inflammation of synovial membrane
- Age: 18 months – 10 years
- Rapid onset of hip pain, limited joint ROM, limping (or inability to walk)
- Rare fever, normal WBC, CRP, ESR <30
- U/S shows effusion

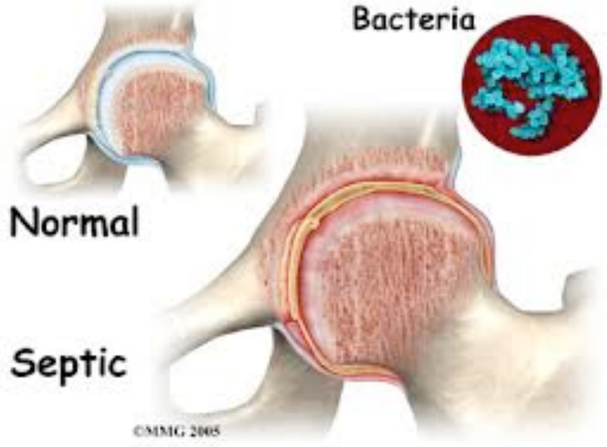
  - Tx: Brief non weightbearing & NSAIDs
    - Most resolve within 2 weeks
    - Recurrence 4-17% within 6 months

www.reddit.com

Septic Arthritis

https://upload.wikimedia.org

- Microbial invasion of joint spaces
- Hematogenous spread
- Urgent medical management (differentiate from transient synovitis)
- Acute onset of joint pain
  - limp or refusal to walk
  - hx of mild trauma or concurrent infection/illness
- Progresses to febrile systemic illness



- Age < 10 years
- Approx. 90% lower extremity
- Monoarticular

Septic Arthritis

https://upload.wikimedia.org

- Physical exam
  - Holds affected extremity immobile
  - Joint swelling, erythema, warmth, tenderness to palpation
  - Pain with passive ROM

- WBC, ESR elevated (Kocher. JBJS 2004)
- CRP > 2mg/dL (Jung. JPO 2003)
- Blood Cx positive in 50%
- X-ray changes 7-10 days
- Definitive DX: synovial fluid
- Staph Aureus most common, R/O group B strep in toddler

- CALL Ortho: Tx = Surgical I&D

Osteomyelitis

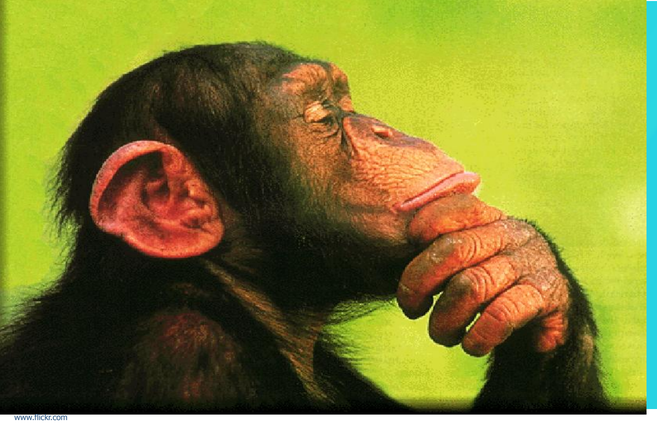
https://upload.wikimedia.org

- Antalgic gait
- Toddlers/children – localized swelling, pain, pseudoparalysis, fever/toxic
- Adolescents may be more indolent
- Xrays and MRI are helpful

- Hematogenous spread – S. aureus most common (also GBS, Diplococcus pneumoniae)
- Rx: antibiotics +/- surgery I&D

Diskitis (Infectious Spondylitis)

- Back pain interferes with normal walking / bending forward (refuses to pick up object from floor)
- Not appear ill, ESR elevated in 80%
    - S. aureus most common
- With time: XRs show narrow disk space & bone irregularity
- Bone scan may help localize
- Rx: systemic abx, +/- bracing



Pauciarticular Juvenile Arthritis

- Most common type of juvenile arthritis
- Mild limp in children 2 yrs of age
- Girls:boys (4:1)
- Lab values normal, 50% with normal ANA
- Most commonly involved joints
  - Subtalar, ankle, knee with limited ROM

- Refer to rheumatologist

Neurologic Disorders

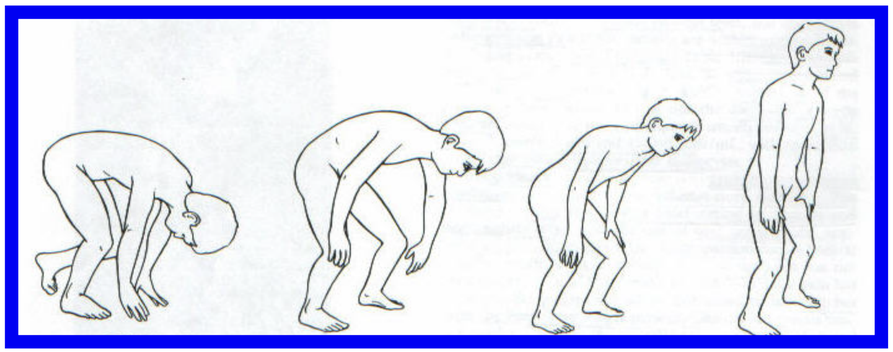
- Cerebral Palsy
- Muscular Dystrophy

- Consider if child has always had an abnormal gait

- Delayed start to ambulation (>18 months)

Muscular Dystrophy

- Proximal muscle weakness gait
- Usually first noted in boys 2-5 y
- Hx: delayed ambulation, frequent stumbles, falls, difficult climbing stairs
- Gower's sign, toe-walking
- +/- pseudohypertrophy of calf
- Elevated serum CPK



- Refer to neurology

Cerebral Palsy (CP) Definition

RESIDUAL MOTOR EFFECTS OF:

Brain lesion is static
(Static Encephalopathy)
The child's function is not static

Hx: premature, develop delays

- Limited ROM in ankle/knee
- Hyperreflexia, clonus

Anatomic Disorders

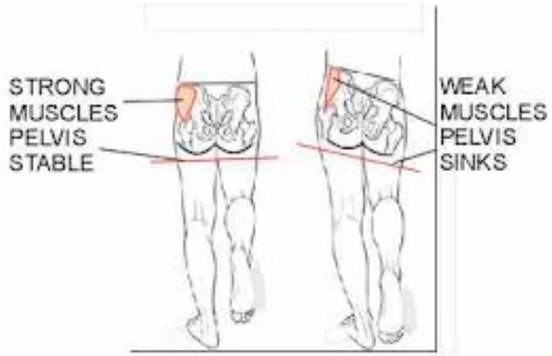
- Developmental Dysplasia of Hip (DDH)
- Legg-Calve-Perthes Disease
- Slipped Capital Femoral Epiphysis (SCFE)
- Toddler's Fx
- Growth plate fracture
- Overuse syndromes
- Limb length discrepancy
- Femoral/Tibial Torsion
- Foot deformities: clubfoot

https://i1.sndcdn.com/artworks-SGSNLQ735IrgKi2r-AIBKeg-t500x500.jpg

Developmental Dysplasia of Hip (DDH)

- Painless limp in toddler (trendelenburg gait)
- Femoral head partially or completely displaced from acetabulum
- Slight delay in ambulation (14-15 mo)
- Shortened leg with restricted abduction of affected hip

- If bilateral, waddling gait
  with swayback
  (excessive lumbar lordosis)



Legg-Calve-Perthes Disease

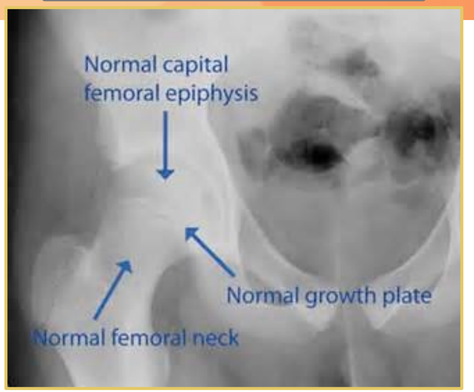
- AVN of proximal femoral epiphysis in children 4-12 yo
- Boys:girls 4:1

- Antalgic gait exacerbated by physical activity, alleviated by rest, worse later in day +/- night pain

- Exam depends on severity – greater loss of abduction and internal rotation with more severe disease

- Refer to Ortho
  - MRI & bone scan: early before radiographic changes

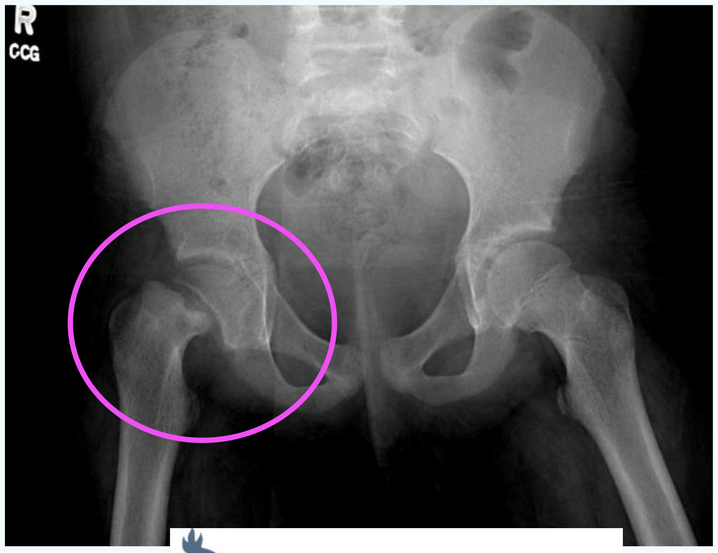
Slipped Capital Femoral Epiphysis (SCFE)



- Antalgic gait in adolescent
- Capital femoral epiphysis displaces posterior & medial on femoral neck
- Slippage: acute or gradual
- Boys (12-15 y) > girls (10-13 y)
- Younger: metabolic / endocrinopathy

  Age < 10 or >16, non-obese

  (hypothyroid, low GH, pituitary tumor, renal osteodystrophy)



- Constant, mild pain hip/groin/thigh or KNEE in overweight kid
- Pain with PROM, decreased IR/abduction, Hip = flexed & ER
- Acute slippage has increased incidence of AVN
- Dx: Xrays Hips AP/lateral = Bilateral in 1/3

Toddler's Fracture

- Torsion injury produces spiral fx of tibia without fibular fx
- Initial XR may appear normal
- F/U XR in 1-2 wks show new bone

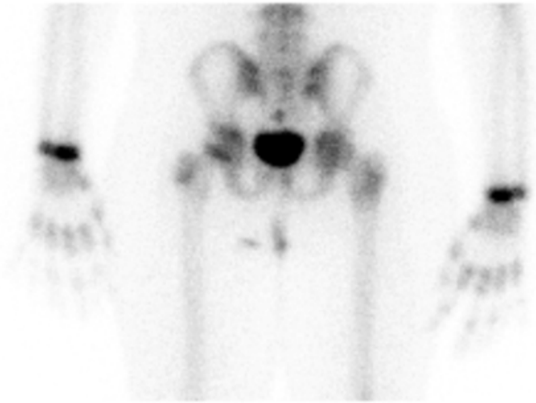
Treat with short term immobilization
3-4 weeks

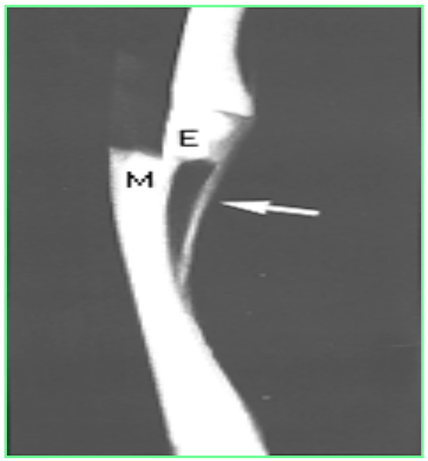
Navigate Location
Where to Find the Why

Watch the kid & Ask the family:

- Can she walk?
- Can he crawl?
- Do they standing like a flamingo?

Fractures Common only in Skeletally Immature



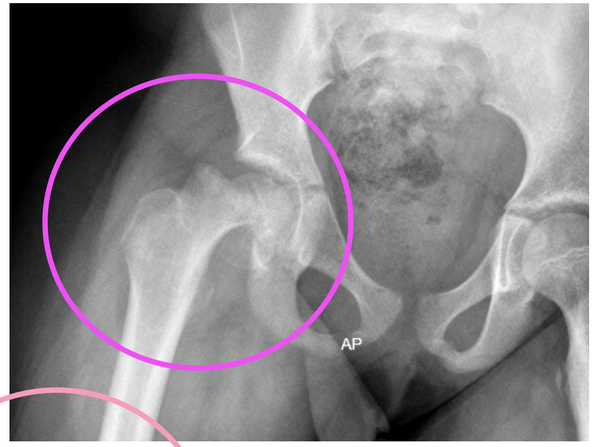


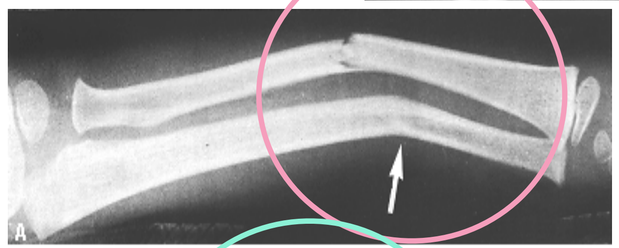
Physeal injuries
“weak link”= physis

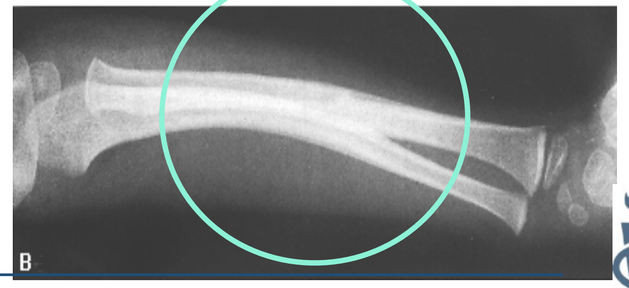
Buckle or Torus

Plastic Deformation

Greenstick Fracture







Salter - Harris Classification

Type I - through physis
Type II - through physis & metaphysis
Type III - through physis & epiphysis
Type IV - through metaphysis, physis & epiphysis
Type V - crush injury to entire physis

Growth Arrest Secondary to Growth Plate Injury

Complete cessation longitudinal growth
= limb length discrepancy

Partial cessation
= angular deformity if peripheral
progressive shortening if central

Limb Length Discrepancy

Apparent in children 4-10 yo

Toe-walk to keep pelvis level

To accurately measure:

child stands with shorter extremity on blocks until the pelvis is level

Need standing film of entire lower extremities

Overuse Syndromes

SciTechDaily.com

Apophysitis (Osgood-Schlatter)

Point tenderness at tibial tubercle

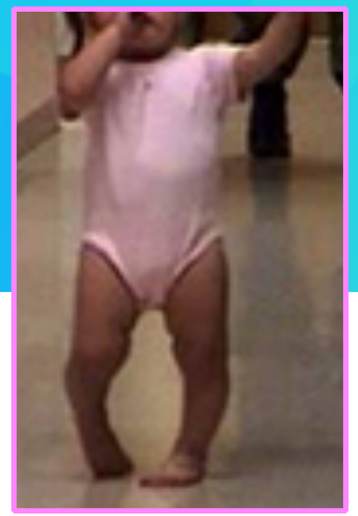
Apophysitis: (Sever)

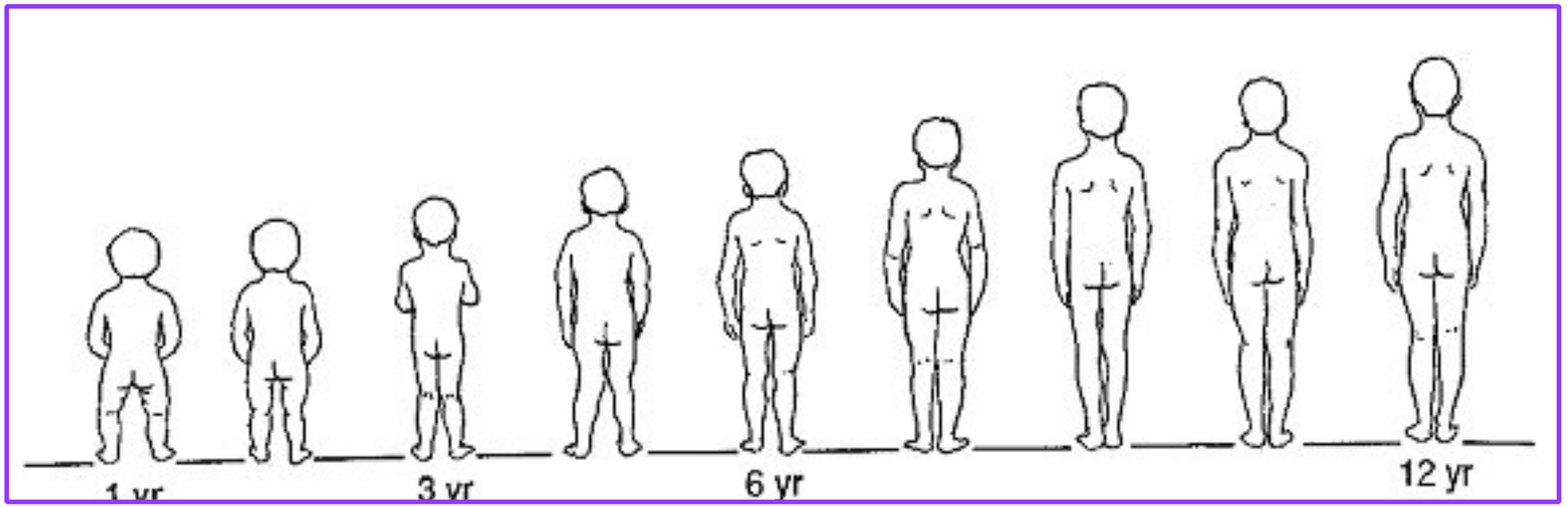
Point tenderness at calcaneus growth plate

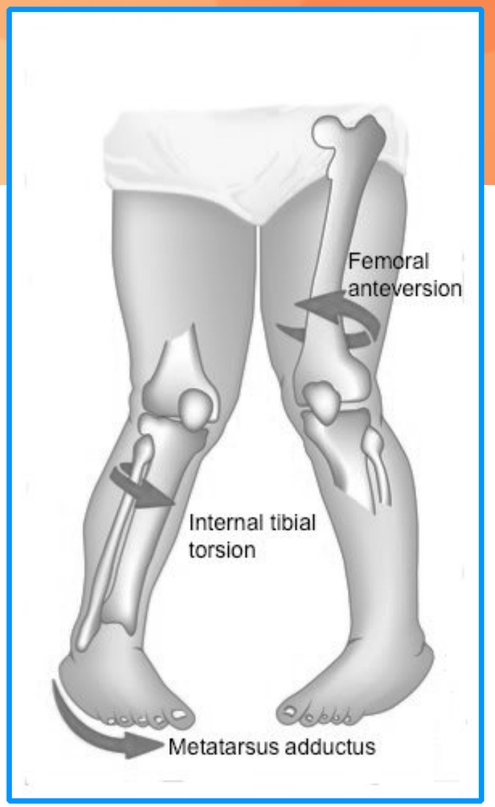
Stress Fx's

Bone scan

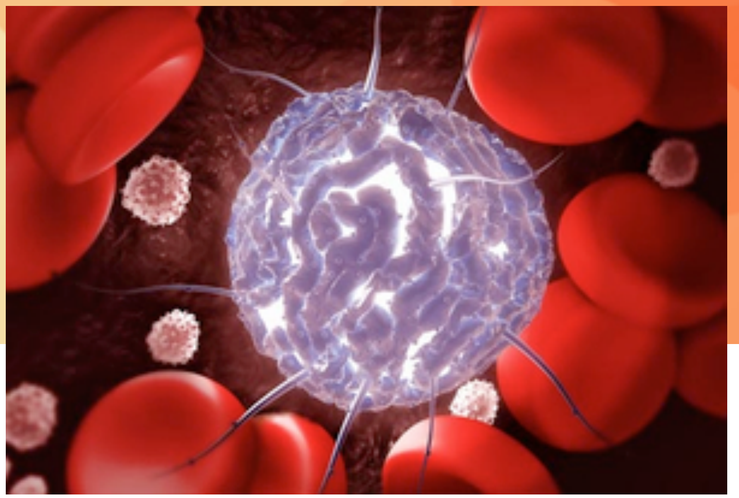
Normal Torsion







Neoplasms: Leukemia



https://cme.uchicago.edu/Relapse2018

Most common cancer in children < 16 y
Peak incidence 2-5 y

20% with musculoskeletal c/o = Joint symptoms & bone PAIN causing LIMP

Fatigue, skin bruising & bleeding, hepatosplenomegaly should alert clinician
Initial XRs unremarkable, or transverse zones of lucent metaphyseal bands adjacent to physis

Dx: Labs, Bone marrow aspiration & biopsy

Final Thoughts

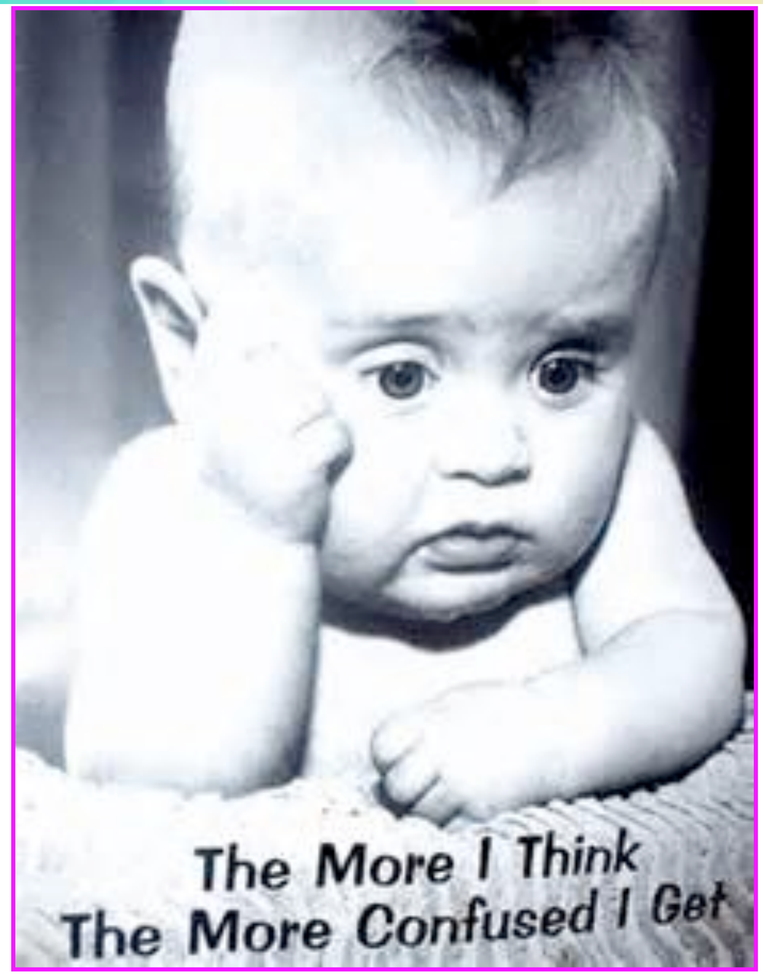
Remember pediatric skeletal differences

Diagnose common conditions

Listen … the kid will give you the answer!

www.pinterest.com/

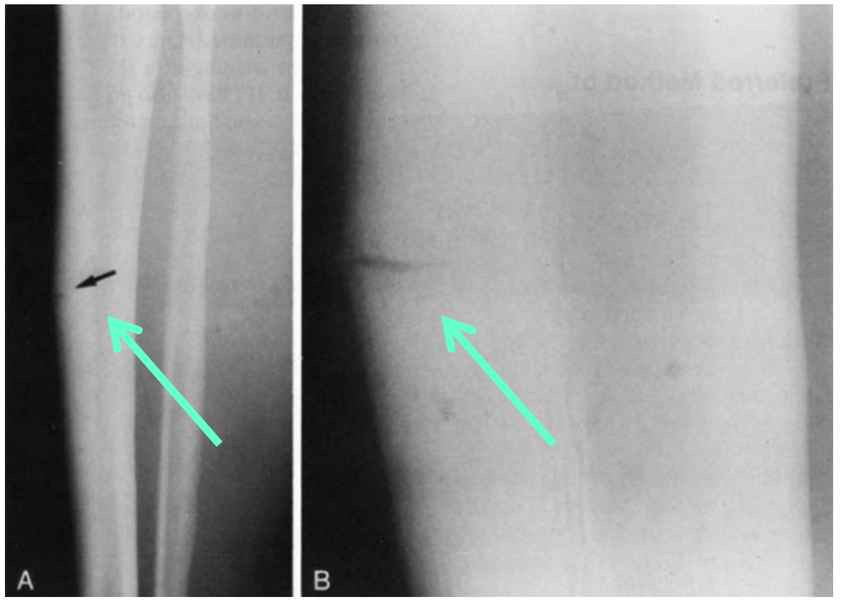
Questions ? ? ? for you

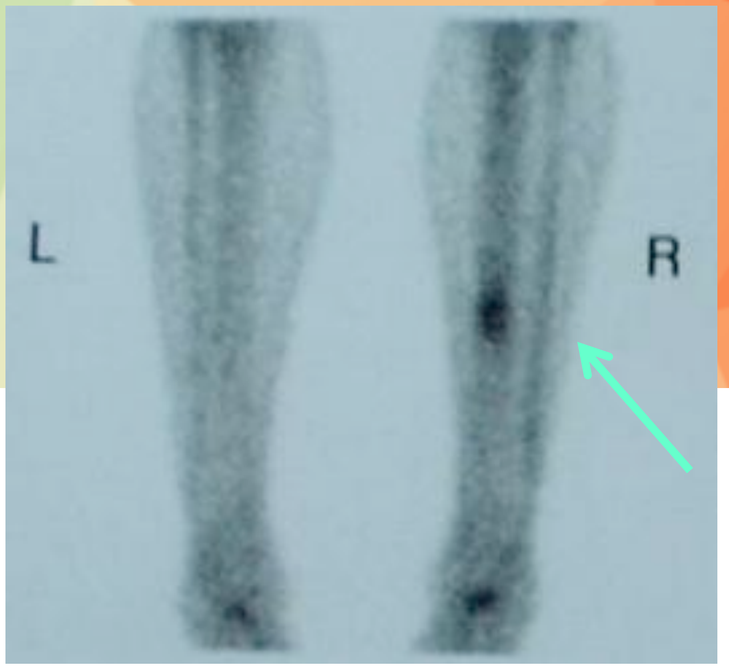


www.pinterest.com/

A 17-year-old basketball player has had a sore shin for the past 6 months, now is unable to continue playing. Radiograph of the tibia shows a horizontal radiolucent line in the anterior tibia, the site of maximal tenderness.
Management consists of

1. non-weight-bearing with crutches
2. additional labs including CBC, CRP, ESR, lyme
3. excisional biopsy and casting
4. return to sports no restrictions
5. amputation





PREFERRED RESPONSE:

1- stress fracture, no sports

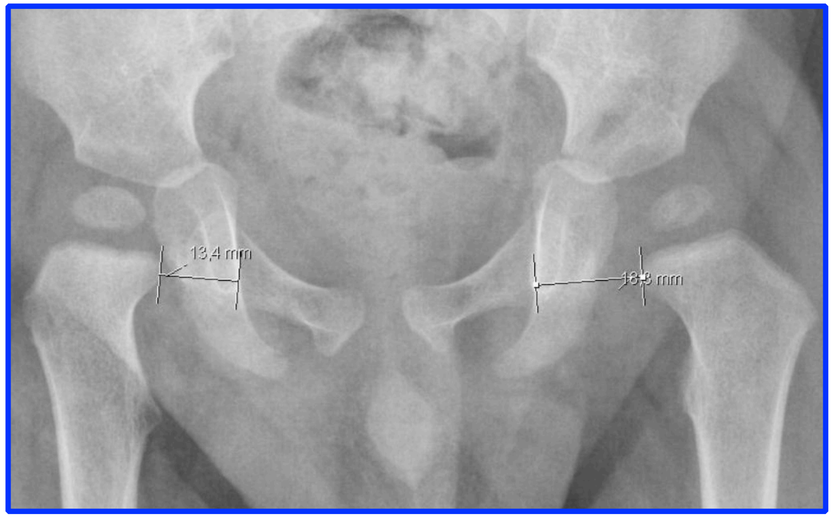
Preferred response is 1, overuse injury with bone subject to repetitive stress. Common in military and runners.

Most improve with sport restriction & observation.

Some require surgical nail fixation.

A 4-year-old boy who had history of fever and hip pain. His parents admit to mild limp and recent upper respiratory infection a few weeks ago. He can weight bear with normal wbc, CRP, and ESR. Radiographs are shown. What is most likely diagnosis:

1. Lyme Disease
2. Septic Arthritis
3. SCFE
4. Developmental hip dysplasia
5. Transient synovitis



PREFERRED RESPONSE:

5- transient synovitis

Preferred response is 5, low suspicion for septic arthritis as child has normal labs & can weight bear.

Most improve with NSAIDS & observation.

Show improvement in 24hours, with complete resolution in one week of presentation.

SciTechDaily.com

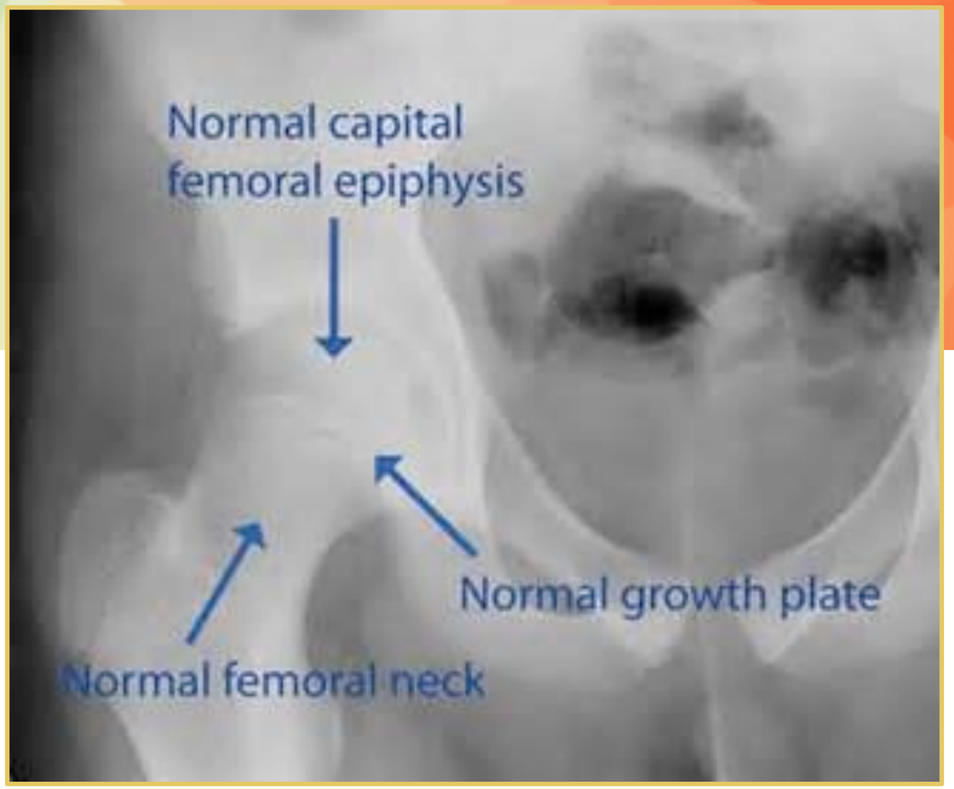
A 12-year-old girl, overweight, has left knee pain, for a few months. There is no obvious history of trauma. On exam she reveals full range of motion at the knee, and will externally rotate of the extremity with hip flexion.

What is your first test to order?

1. observation, no test indicated
2. CBC, CRP, Lyme, ESR
3. vitamin D
4. radiograph of the pelvis
5. MRI of the knee

PREFERRED RESPONSE:

4- radiograph of the pelvis

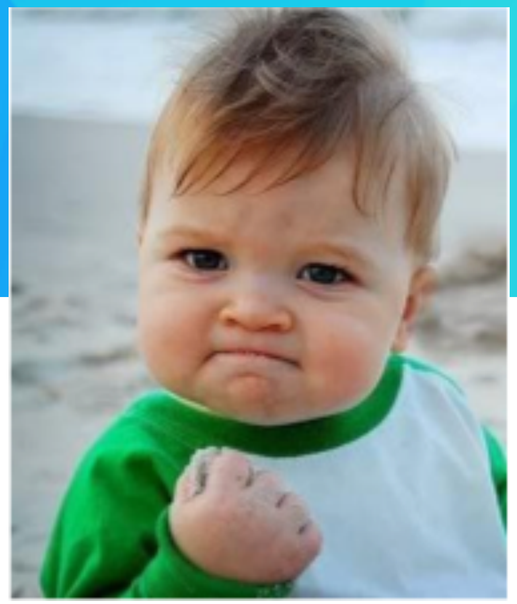


Most common presentation for a SCFE is knee pain.

Treat with Nonweight bearing and admit to hospital or send to ED for orthopaedic surgery.

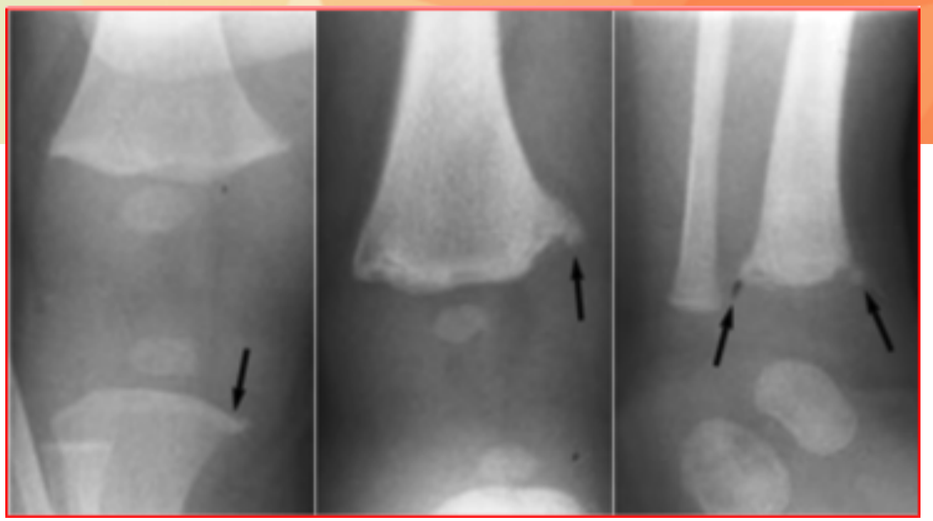
What are the common presenting lesions in children victims of physical child abuse?

1. Femur fracture
2. Head trauma
3. Limping child
4. Bruising
5. Multiple fractures



www.the-sun.com/news/4750666/kids-famous-memes-unrecognisable-now

Child Abuse



Answer 4: Skin Lesions

Bruising 50-92%

Burns = 10-25%

Corner fractures in various stages are in more than 70% of abused children <1 year, 50% in all abused children

Mandatory skeletal survey all suspected <2 y/o

Take Home Points

www.pinterest.com/

www.pinterest.com/

Differential of common conditions

Age, history, PE

Know what to order & what to look for

fractures, deformities, disorders

If you are unsure, ask for help - Phone an friend

Repetition is key!

The more you see, the more you review, the more comfortable you will feel

REFERENCES

Herring, W. Learning Radiology: Recognizing the Basics. 2007.
Mettler. Essentials of Radiology, 2nd ed.
Case videos, photos, examples with permission granted from FMiller, MD
Google Images & Videos
www.pinterest.com
http://www.med-ed.virginia.edu/courses/rad/
www.dictionary.com
www.orthobullets.com
www.AAOS.org
www.POSNA.org
www.AOAO.org

DELAWARE ACADEMY OF
FAMILY PHYSICIANS

QUESTIONS?

**Julieanne P. Sees, DO, MBA,
FAOAO, FAOA, FAAOS**

JSeesDO@osteopathic.org

THANK YOU for your Kind Attention!