DRIVING CHANGE 2023
THE URGENT CARE CONVENTION

Pediatric X-ray Zebras
Crazy cases from the Archives

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URGENT CARE ASSOCIATION®

COLLEGE OF URGENT CARE MEDICINE

The Pediatric Urgent Care Conference
PUCC @ UCA
By PM Pediatric Care

Financial Disclosures

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- I have no financial disclosures

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Objectives

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- Recognize uncommonly encountered imaging findings in pediatric patients
- Understand the imaging work up of several rare diseases
- Be aware of some imaging pitfalls when imaging pediatric patients in children in the urgent care setting
- Case based, interactive format

The Pediatric Urgent Care Conference
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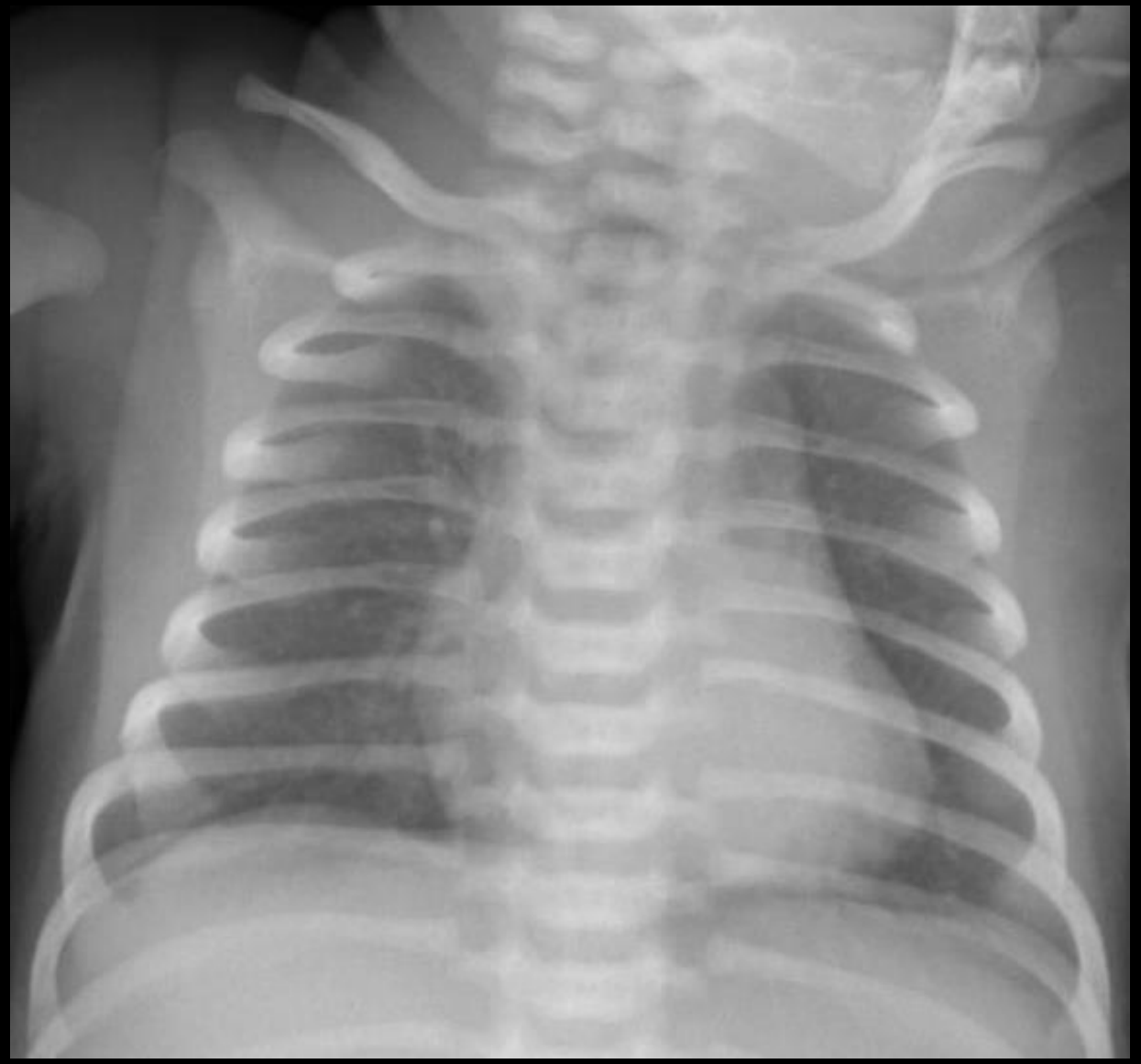
By PM Pediatric Care

CASE 1

1 yo with fever and cough



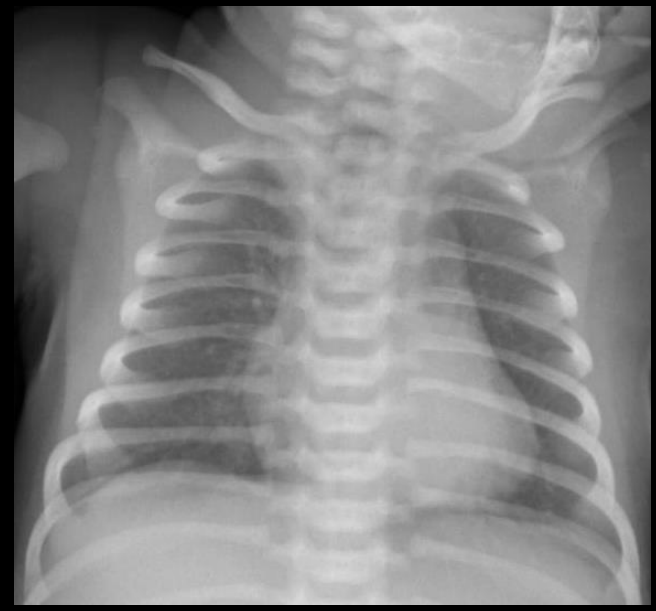
Next appropriate step in management?

A. Supportive management for viral pneumonia

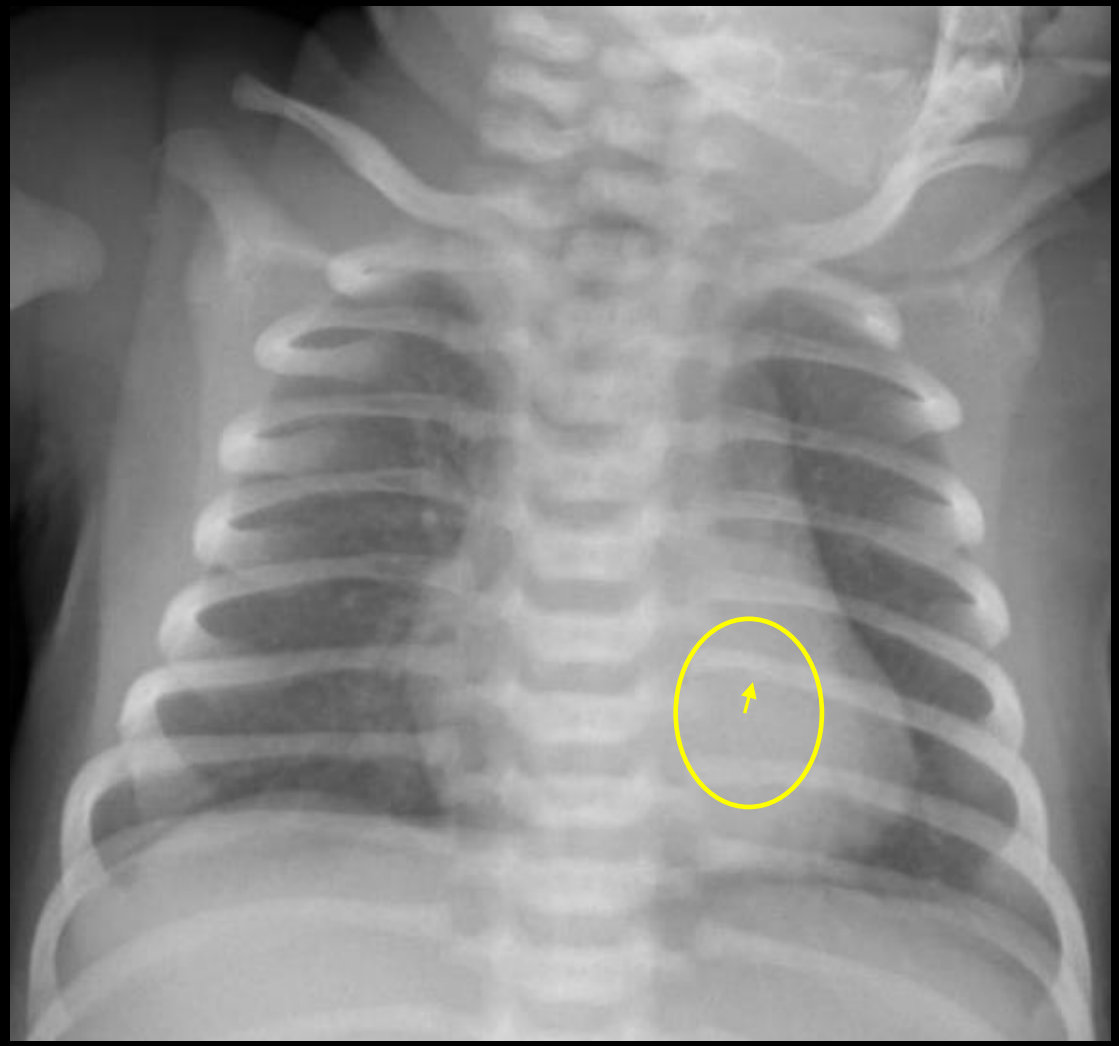
B. Antibiotic therapy for left lower lobe pneumonia

C. Cross sectional imaging (CT or MRI)

D. Skeletal survey for child abuse work up



? Bronchiolitis with LLL atelectasis or pneumonia



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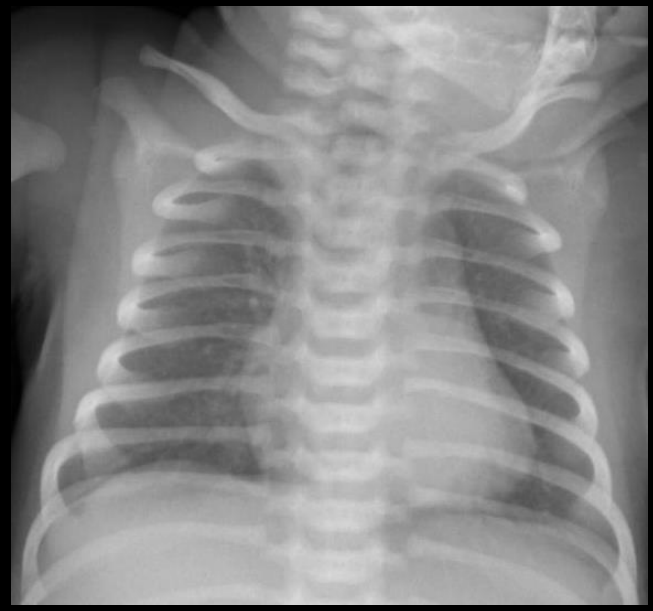
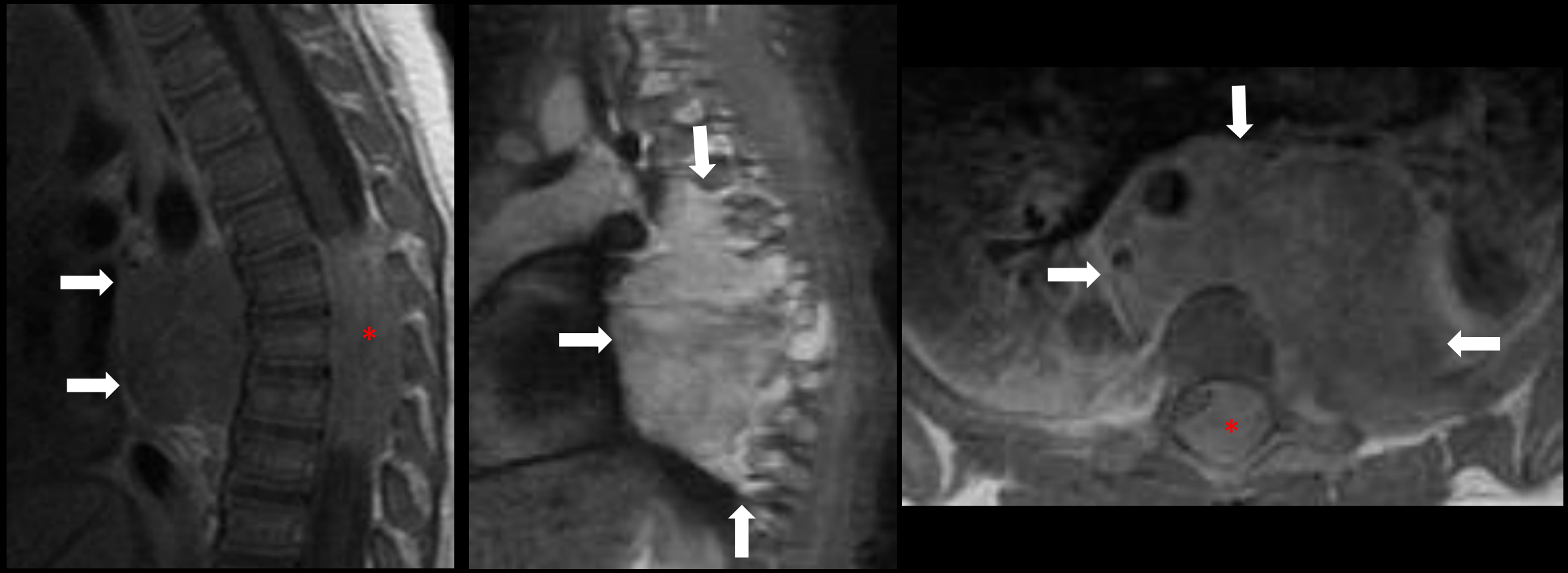
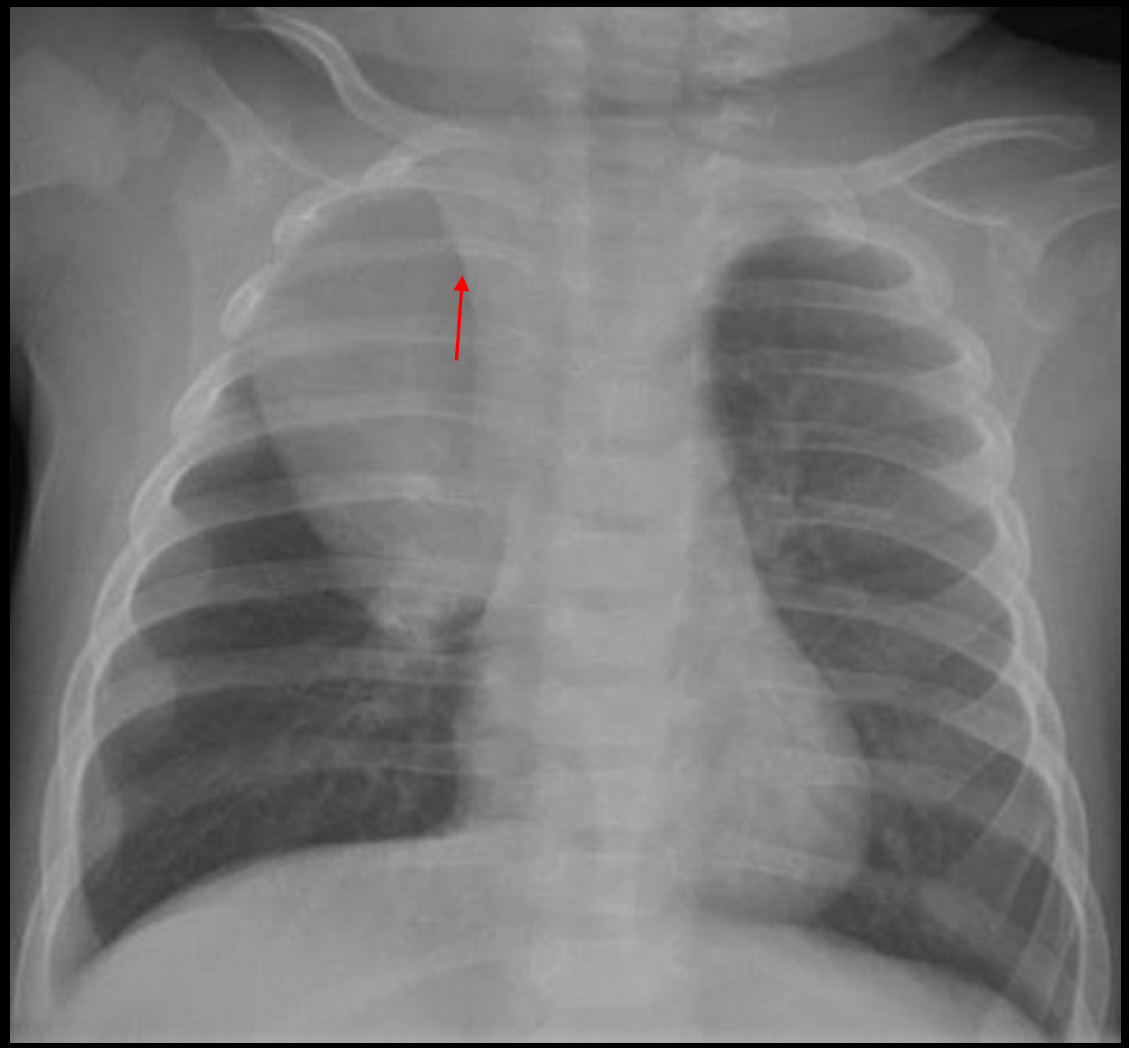


3 months later presents with signs of spinal cord compression



Thoracic neuroblastoma with intraspinal extension (*)

Companion case: Thoracic Neuroblastoma



- Posterior mediastinal mass
  - Sympathetic chain and nerve sheath tumors
    - Neuroblastoma most common
      - Children < 2 yrs
  - 10-16% neuroblastoma occurs in thoracic region
  - May mimic pneumonia or sequestration
  - Air trapping due to extrinsic bronchial compression

Thoracic Neuroblastoma

- MRI
  - Best to assess intraspinal extension
- CT
  - Variable enhancing mass
  - 40% with speckled or curvilinear Ca++

CASE 2

1 yo with lateral ankle swelling for 3 weeks

Which bone is abnormal?

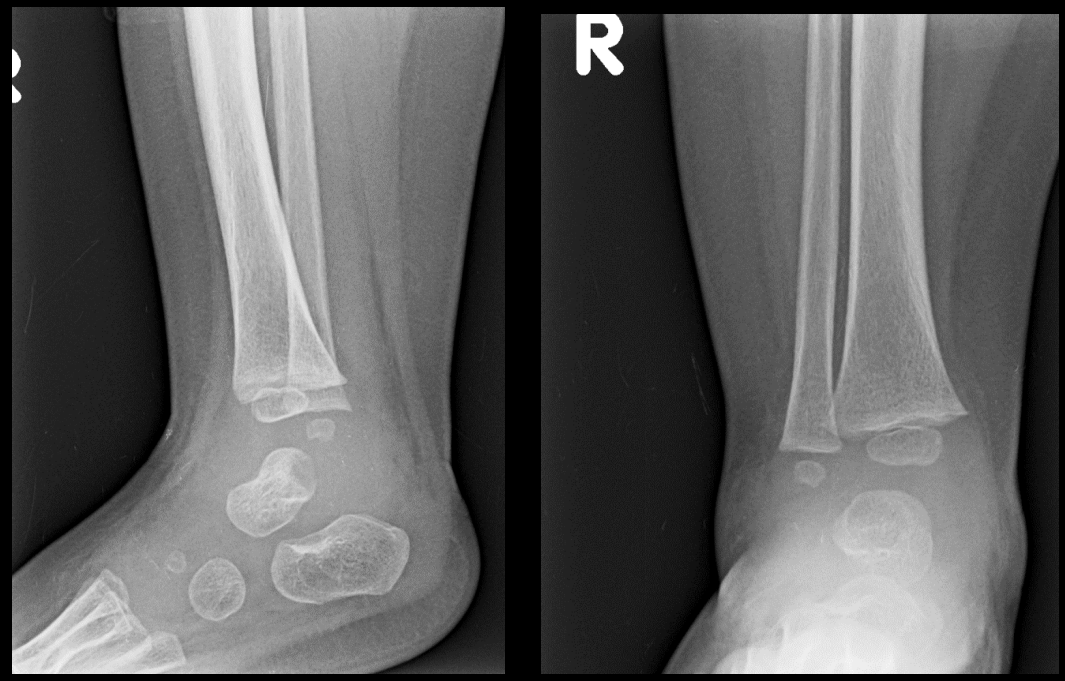
A. Tibia

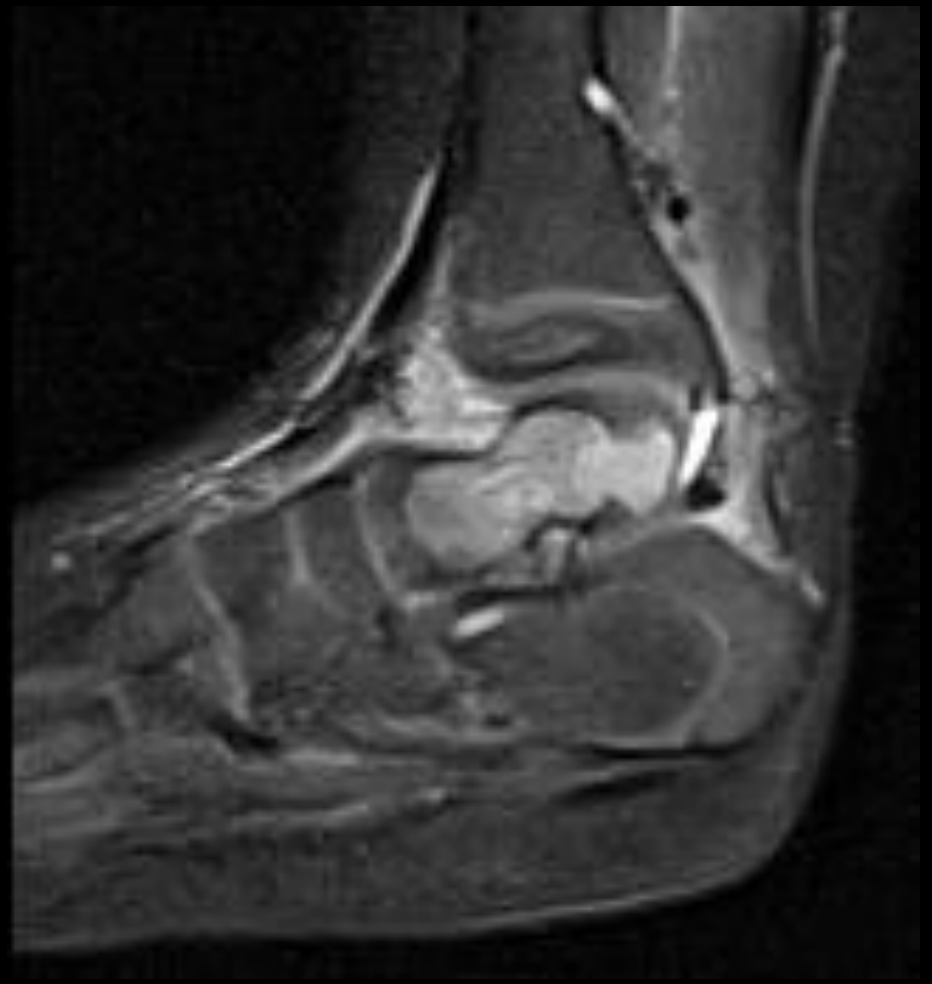
B. Fibula

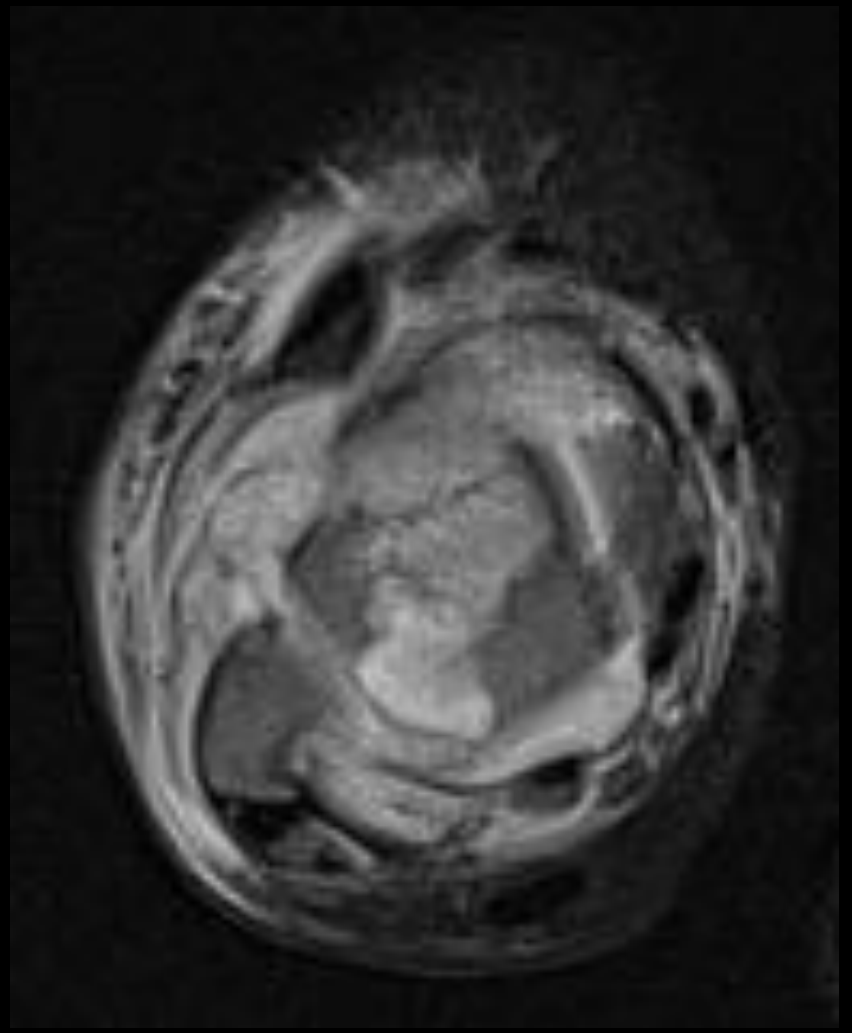
C. Talus

D. Navicular

E. Cuboid







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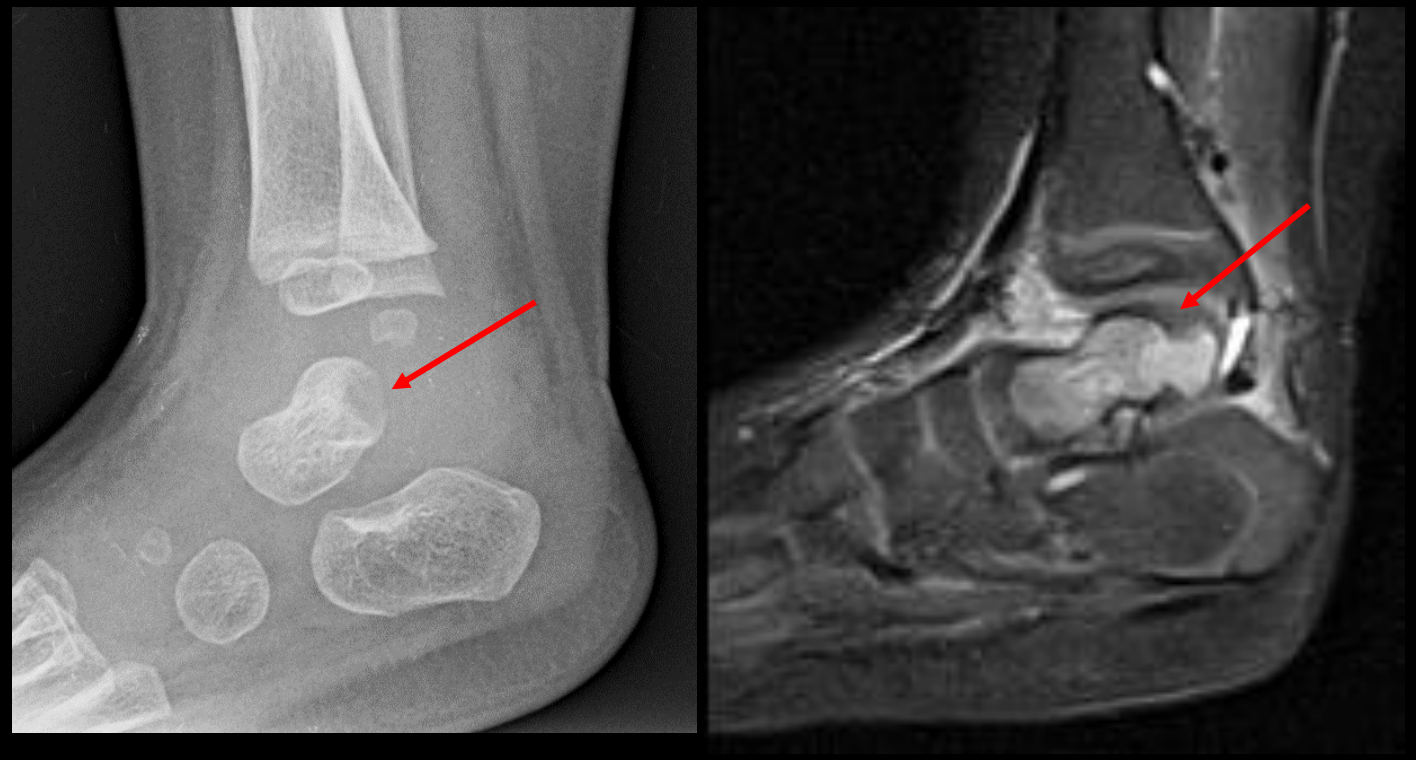
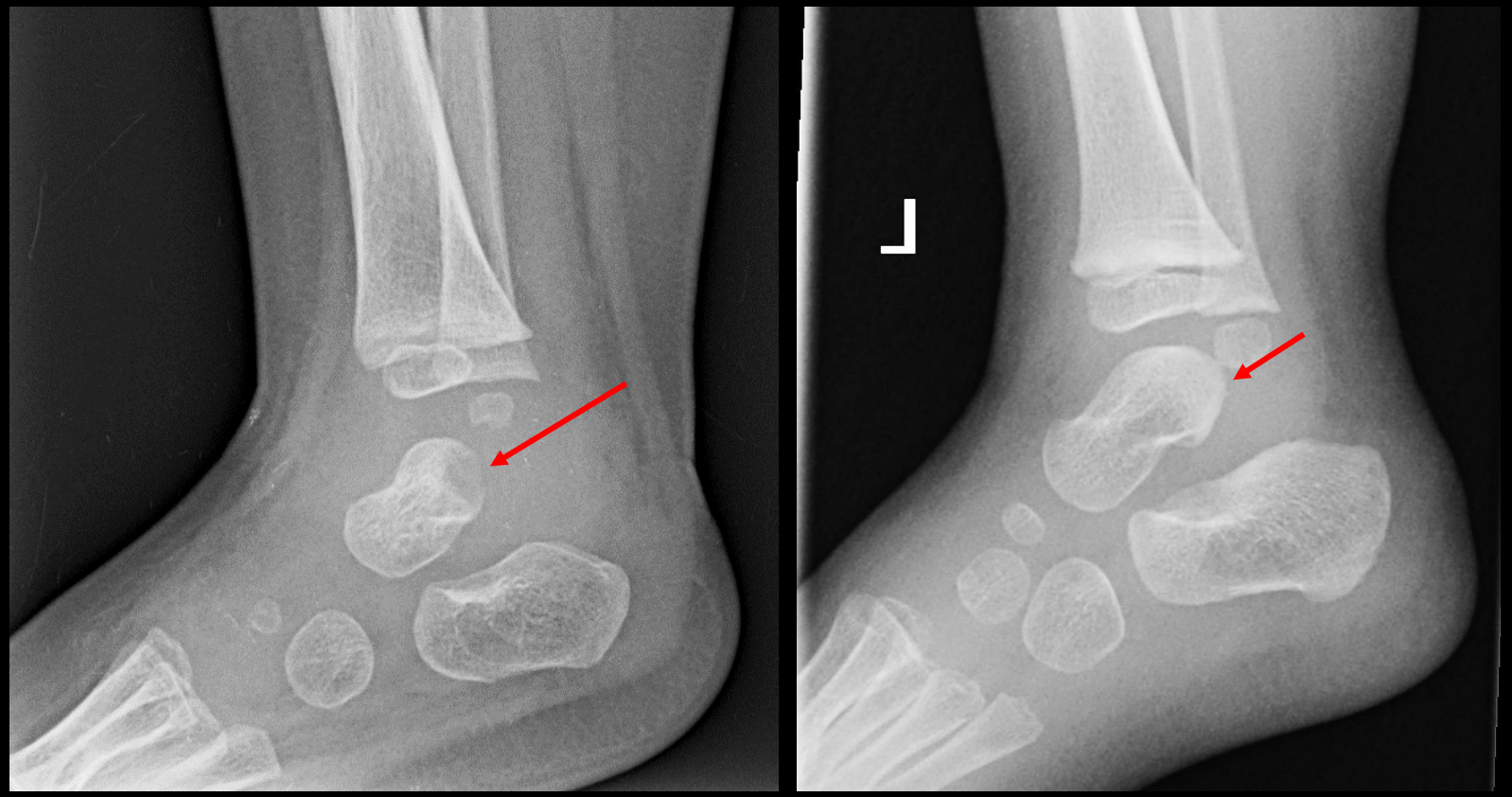




Epiphyseal osteomyelitis

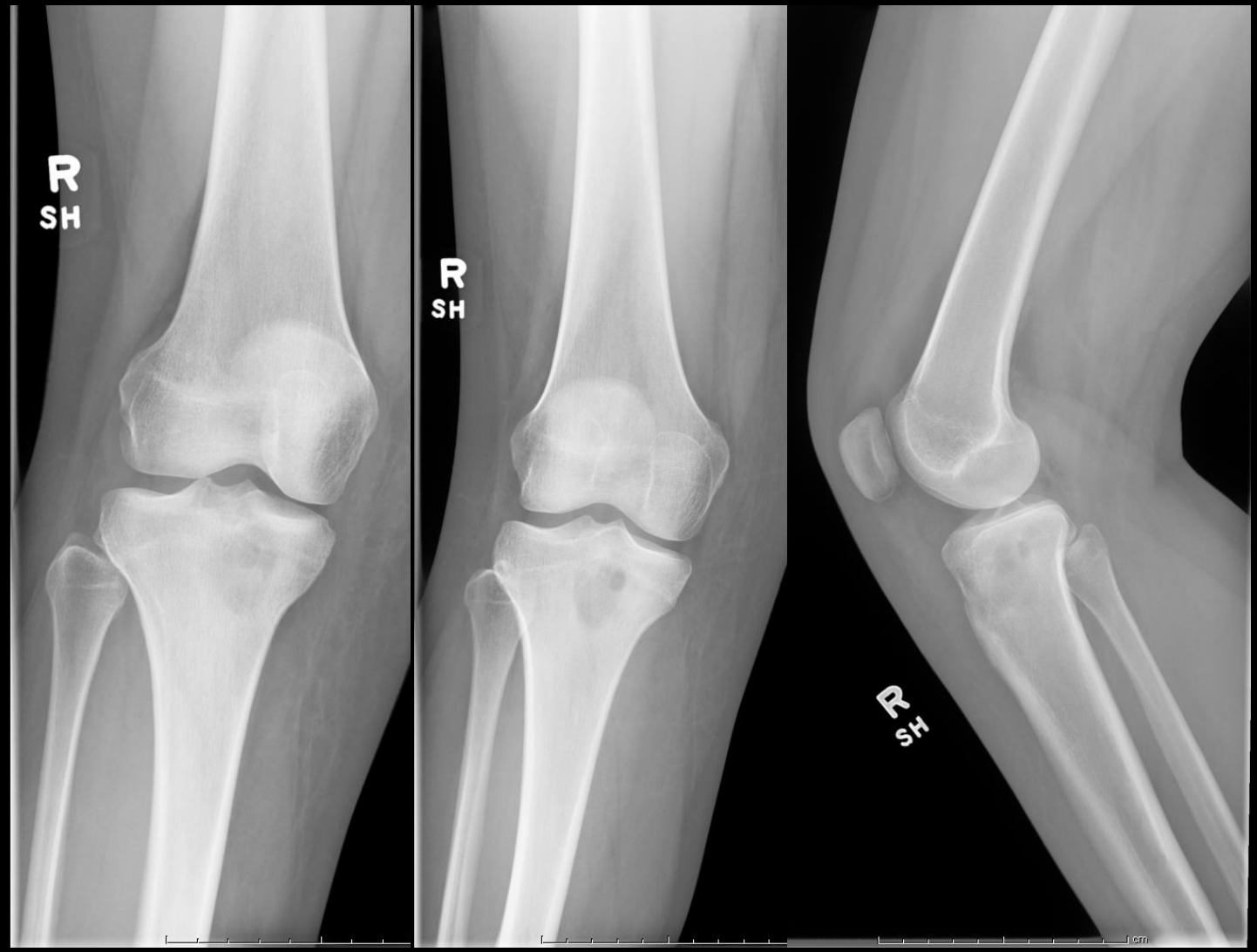
Tarsal bones are “epiphyseal equivalents”

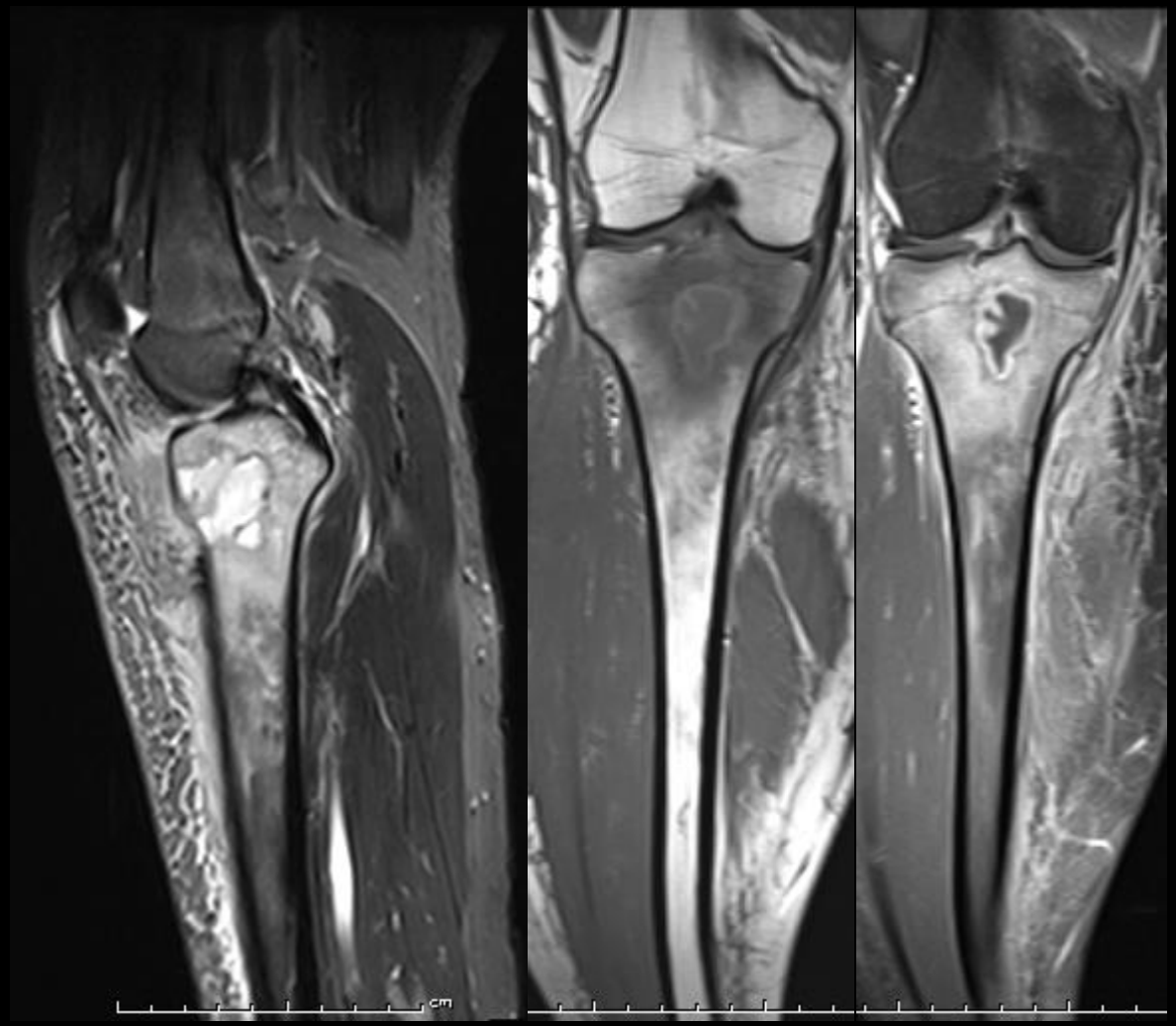
End of bone lesion Ddx: Chondroblastoma, osteomyelitis, Langerhans Cell Histiocytosis, Osteochondral defect (OCD)

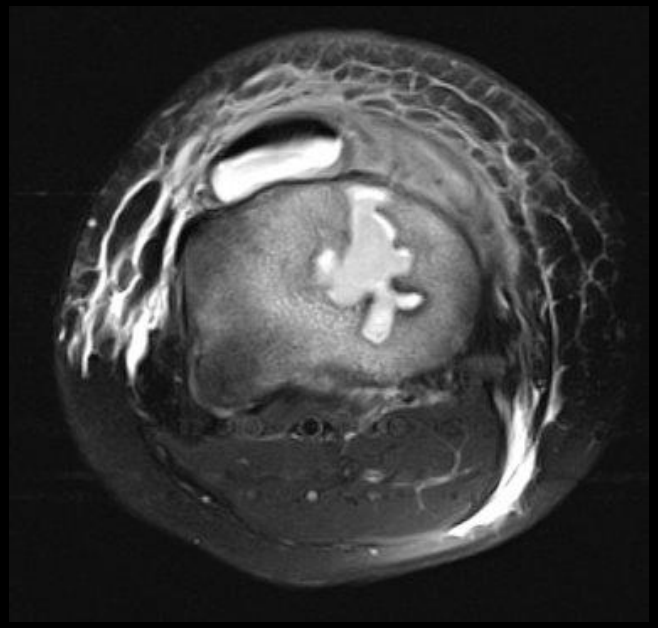
Epiphyseal osteomyeltitis: Metaphyseal location is most common site of osteomyelitis in children due to terminal vascular configuration

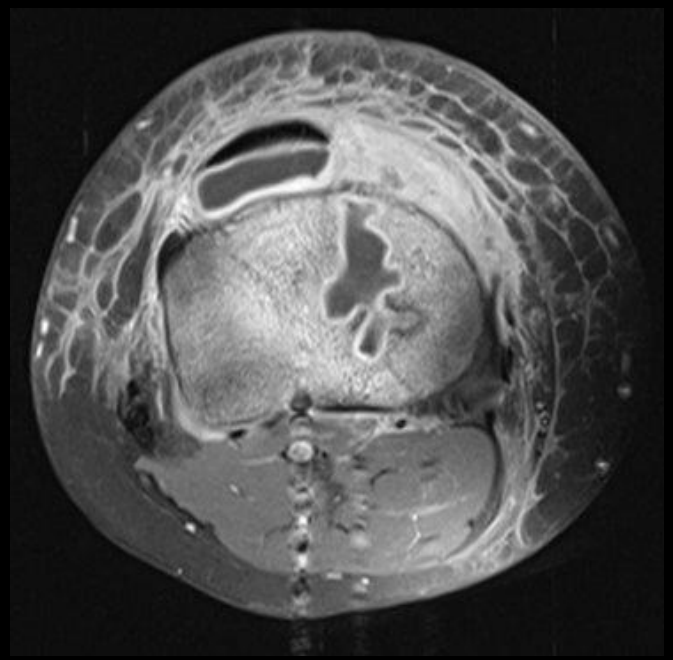
Young children have vessels crossing physis; they may develop osteomyelitis in epiphysis or both locations

Companion case: metaphyseal osteomyelitis, Brodies abscess







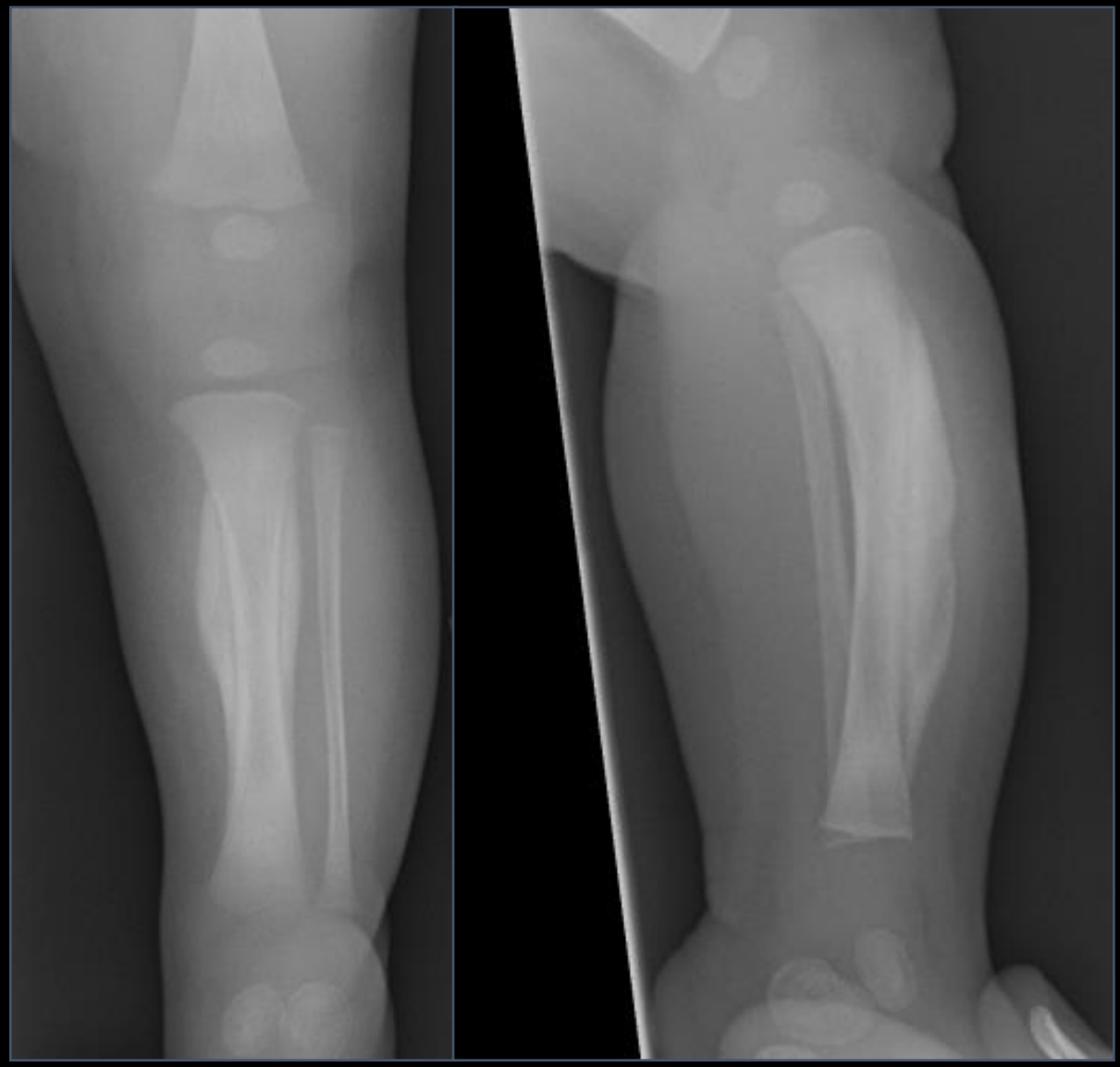


Osteomyelitis, brodies abscess

- Geographic, lucent lesion, non sclerotic margins
- Metaphyseal, juxta physeal location
- Tx: surgical debridement and Abx
  - Goal: avoid leg length discrepancy

CASE 3

Infant with fever and irritability



The type of periosteal reaction is:

A. Benign

B. Aggressive

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A. Benign

B. Aggressive

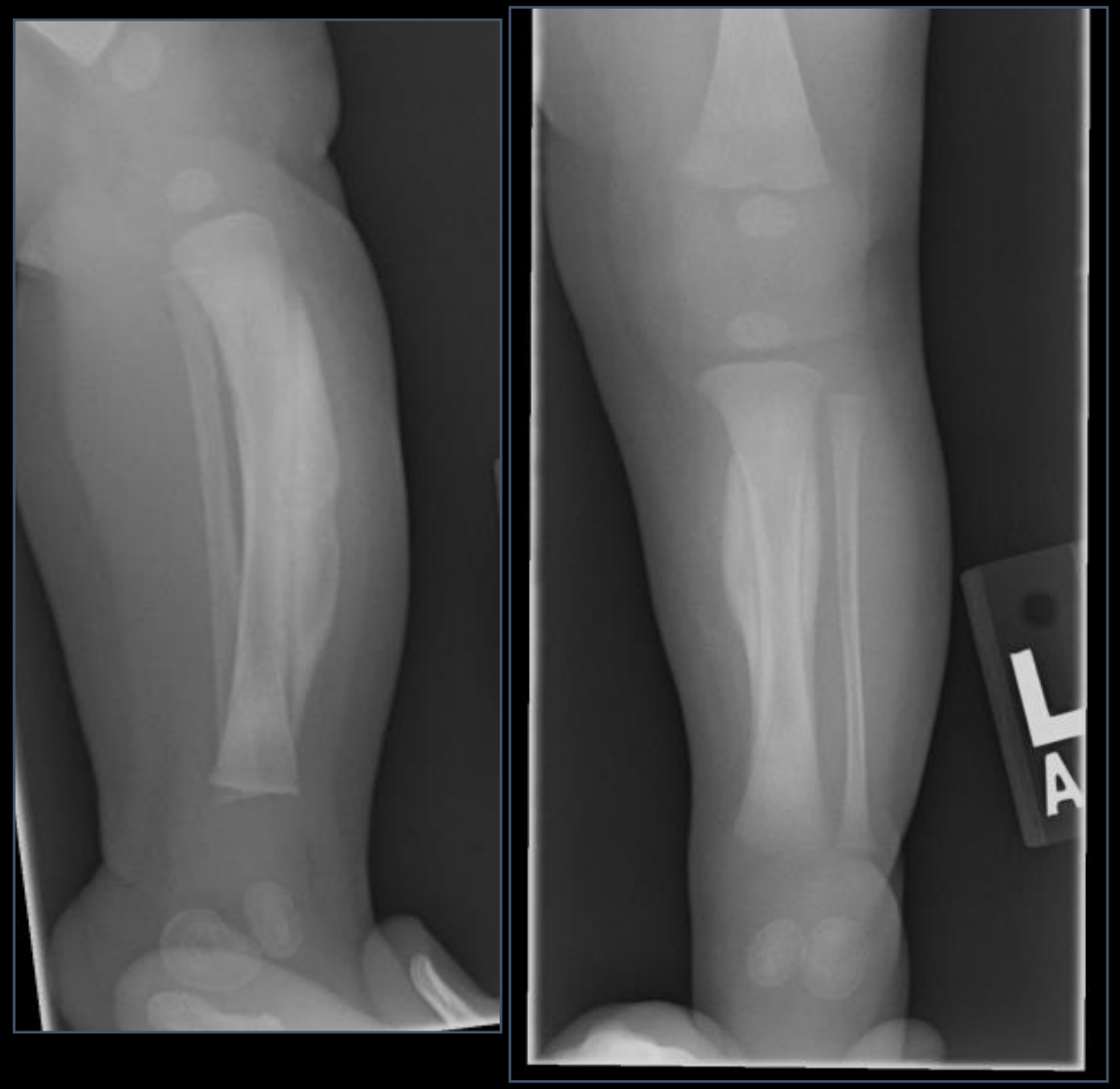
Caffey's = infantile cortical hyperostosis

- 1945 by Caffey
  - DeToni-Caffey
- Average age = 9 weeks, almost always < 6 months
- Self-limiting condition, lasting 2 weeks – 3 months
- Irritability, soft tissue swelling, fever
  - Laboratory: mild leukocytosis, elevated estimated sedimentation rate (ESR), and alkaline phosphatase
- Familial and sporadic forms
  - Autosomal dominant with variable penetrance
  - Mutations in type 1 collagen (COL1A1 gene)
- Mandible (75%), clavicle and ulna most common locations

Caffey's Disease

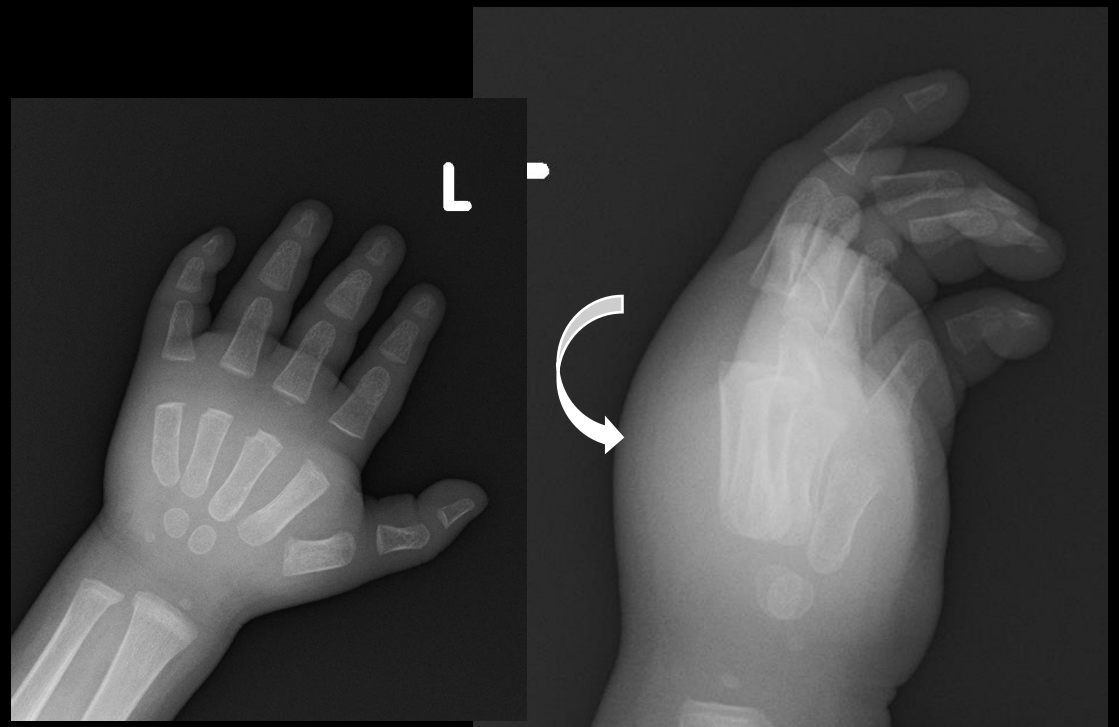
DDx for periosteal reaction:
P: physiologic, prostaglandin
E: EG/LCH
R: Rickets
I: Infantile cortical hyperostosis = Caffey's
O: Osteomyelitis
S: Sickle cell
T: Trauma
E: Ewings sarcoma
A: Hypervitaminosis A
L: Leukemia

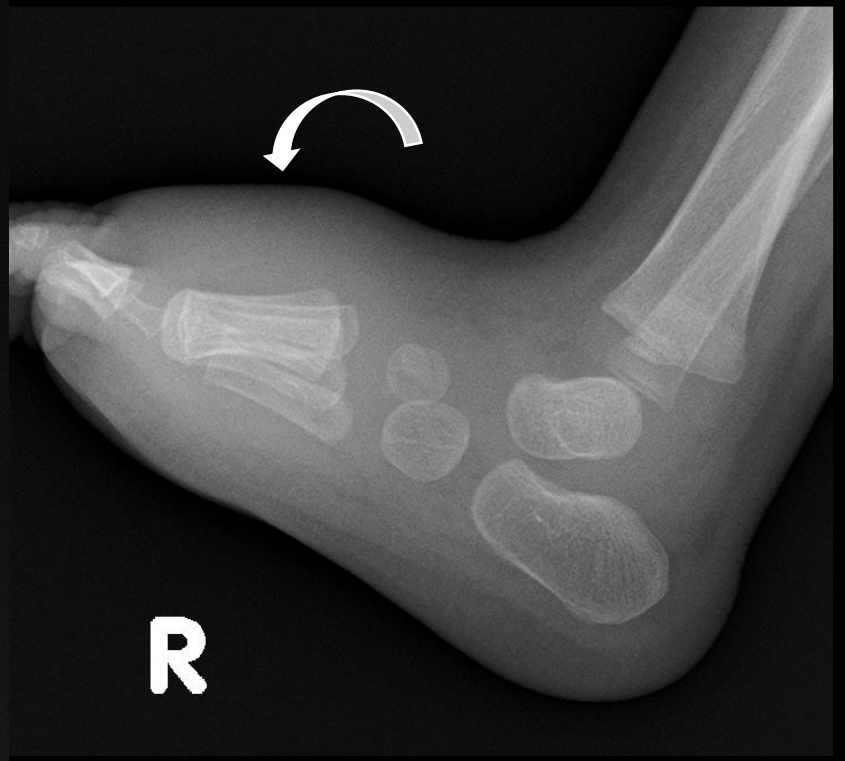
SOCKS: Syphilis, osteosarcoma, child abuse, kinky hair, scurvy



CASE 4

9 month old male with fever, Left hand & Right foot swelling, concern for osteomyelitis





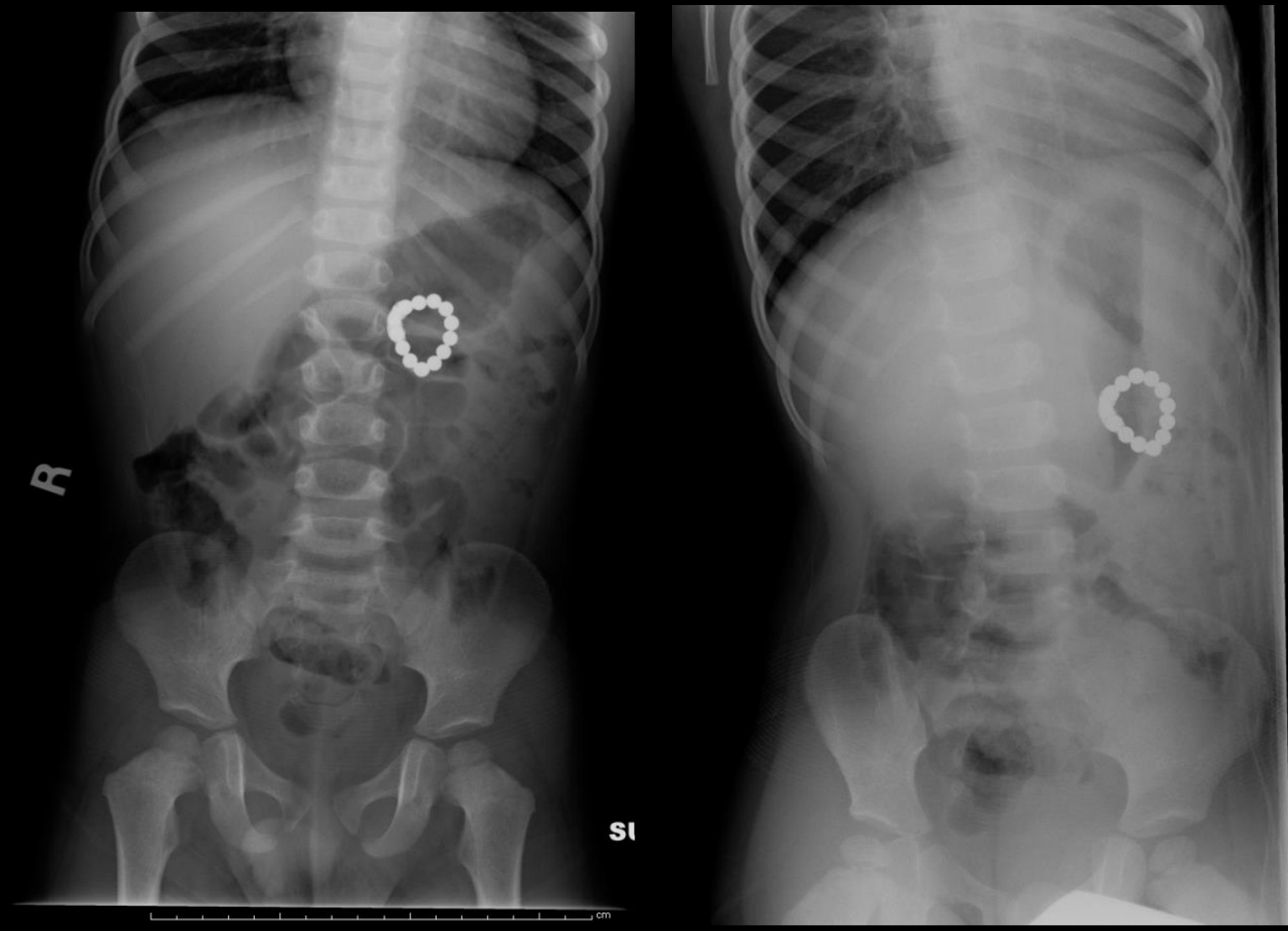
4 weeks later

Sickle Cell Dactylitis

- AKA Hand Foot Syndrome
  - Due to marrow infarction of red marrow
- Infants and young children
  - most common 6 months – 2 years
- Acute onset of symmetric hand and foot swelling, +/- fever
- XR: changes seen 7-10 days after onset of symptoms
  - Cortical thinning, bone destruction.

CASE 5

Foreign Body Ingestion



The foreign body represents:

A. Bracelet
B. Batteries
C. Magnets
D. Legos

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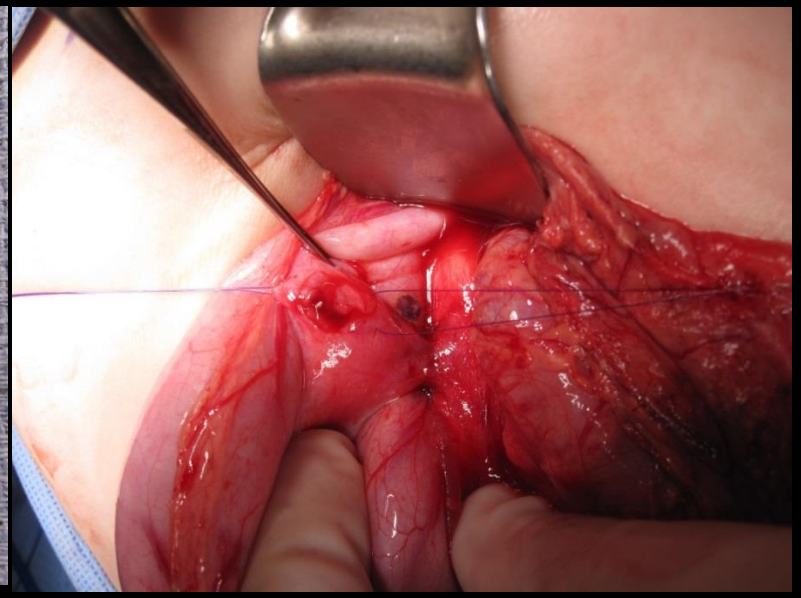
Ingestion of magnet foreign bodies → multiple bowel perforations



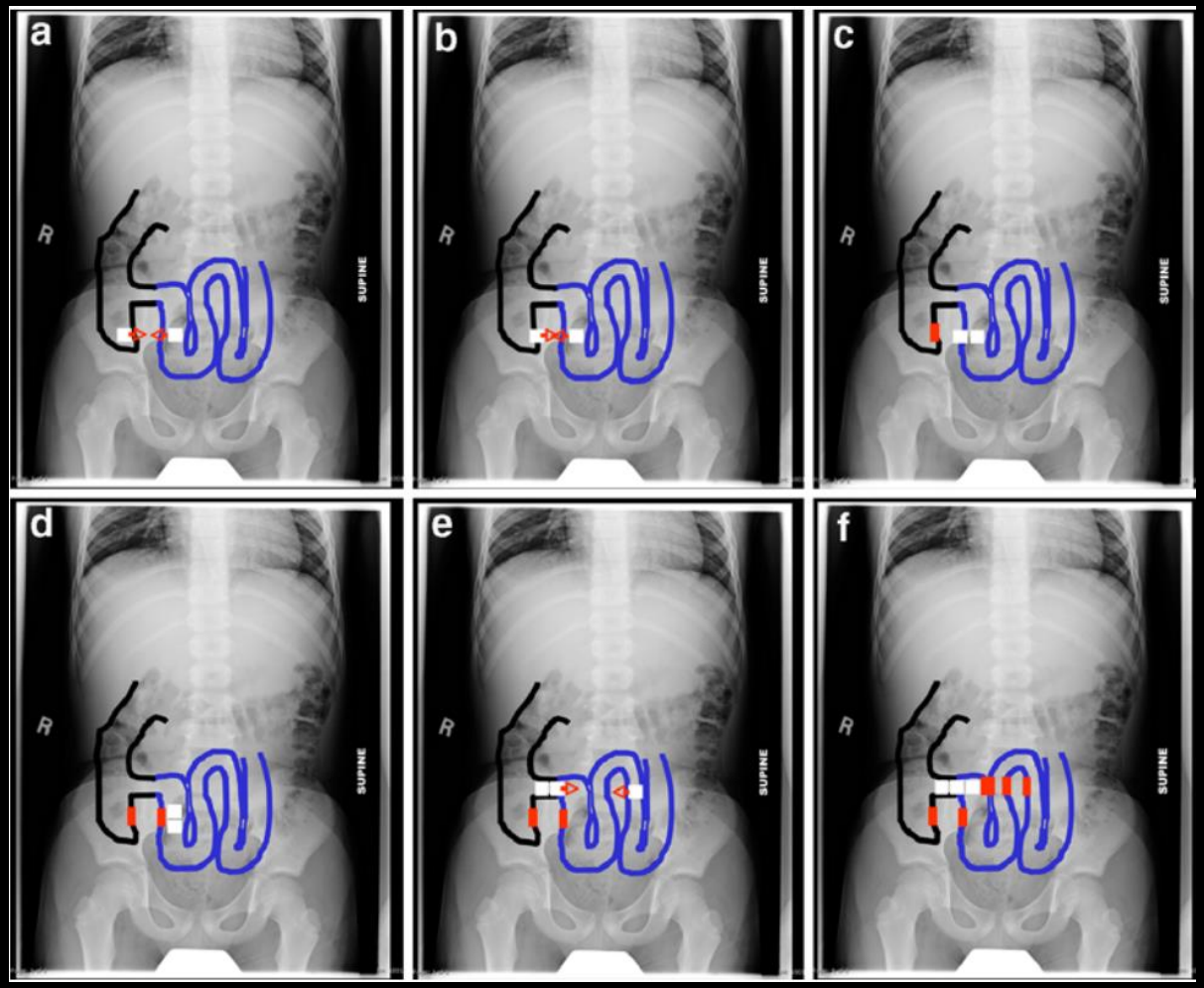
- Ingestion of multiple magnets is an ominous scenario
- Located in different bowel loops, attract each other → pressure necrosis → bowel perforation.

Pediatr Radiol (2007) 37:933–936
DOI 10.1007/s00247-007-0542-x

CASE REPORT

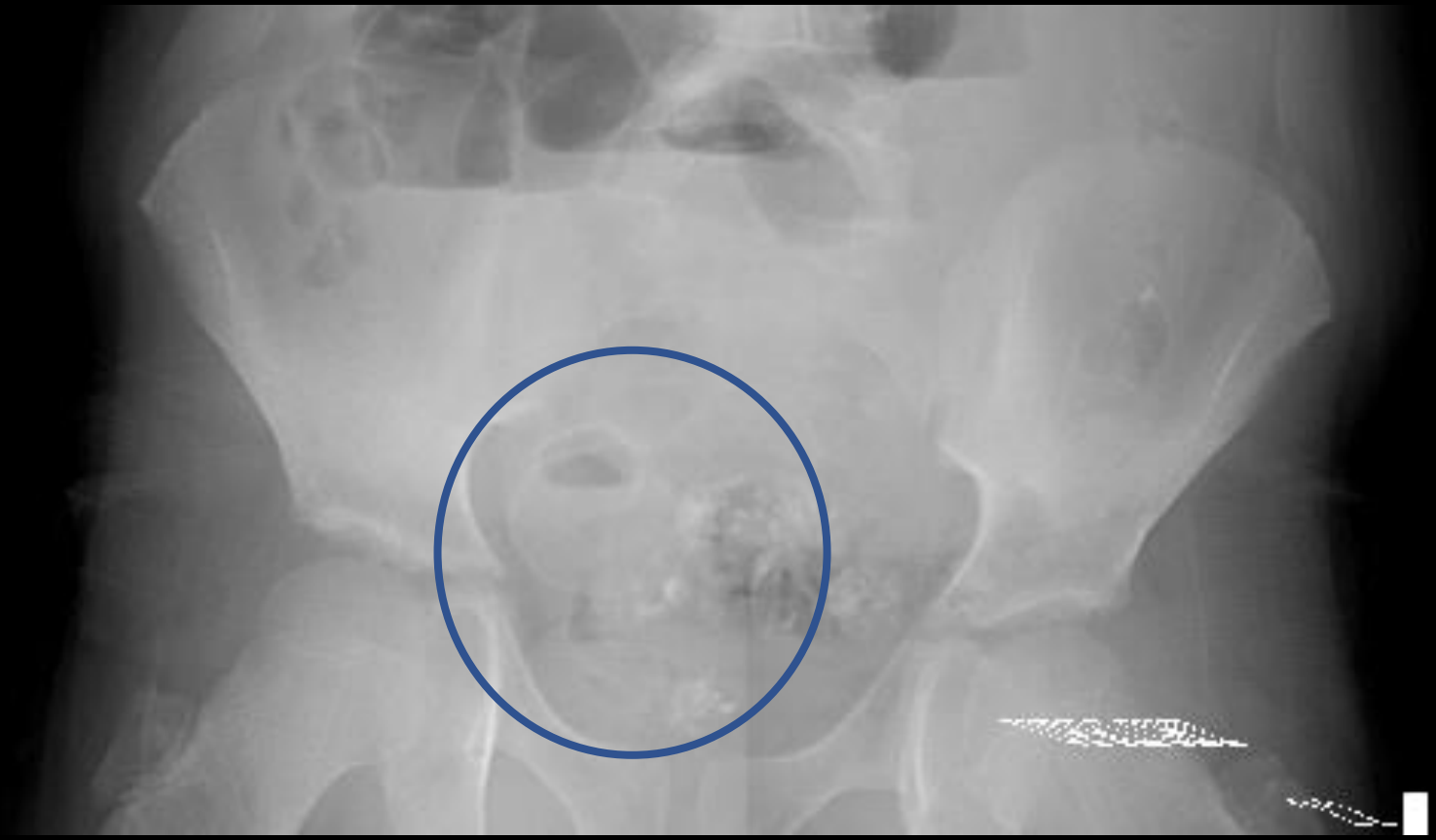
Ingestion of magnetic foreign bodies causing multiple bowel perforations

Moritz F. Kircher · Sarah Milla · Michael J. Callahan



Companion case: 10 month old with foreign body ingestion

Companion case: 9 year old autistic male with emesis

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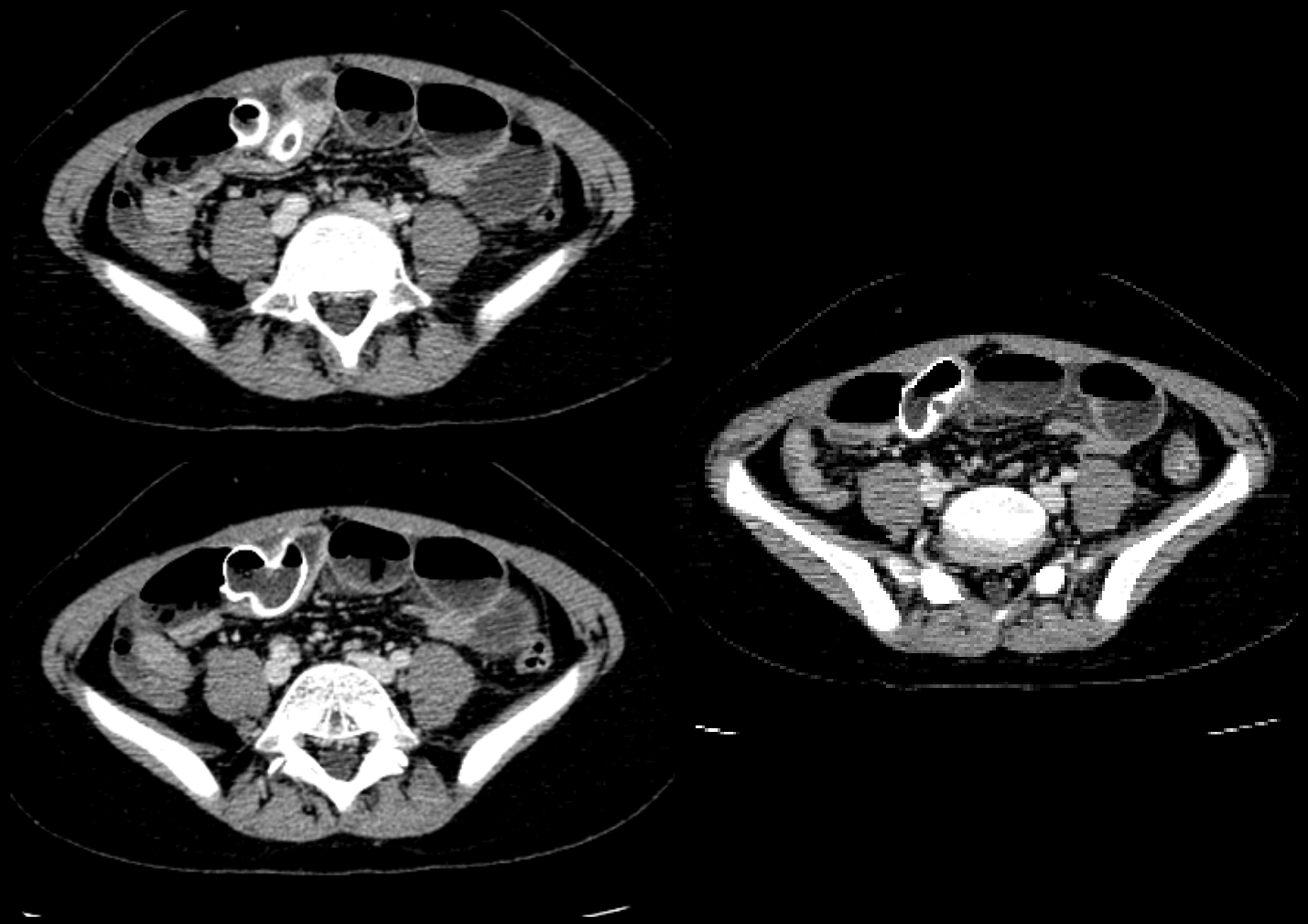

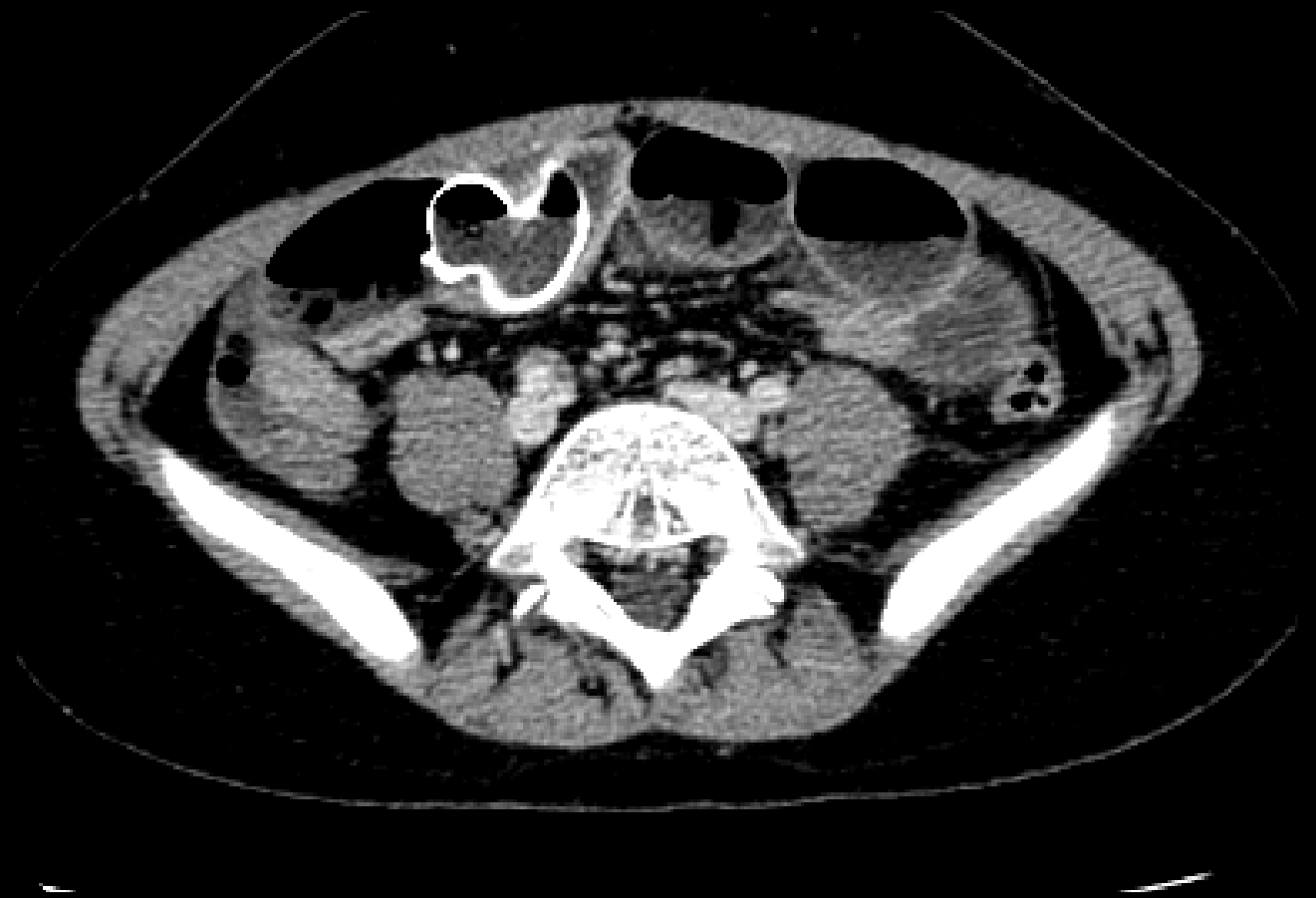


[AHR]
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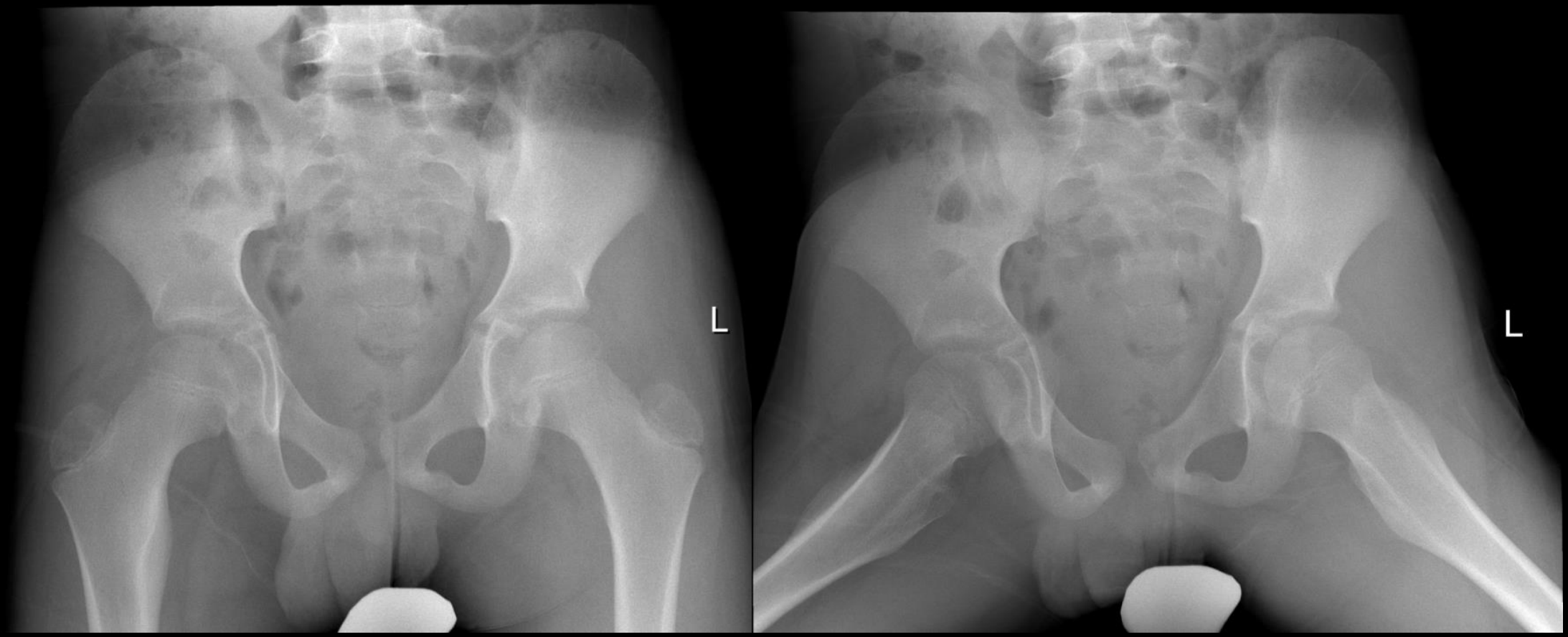
CASE 6

11 yo M with right hip pain



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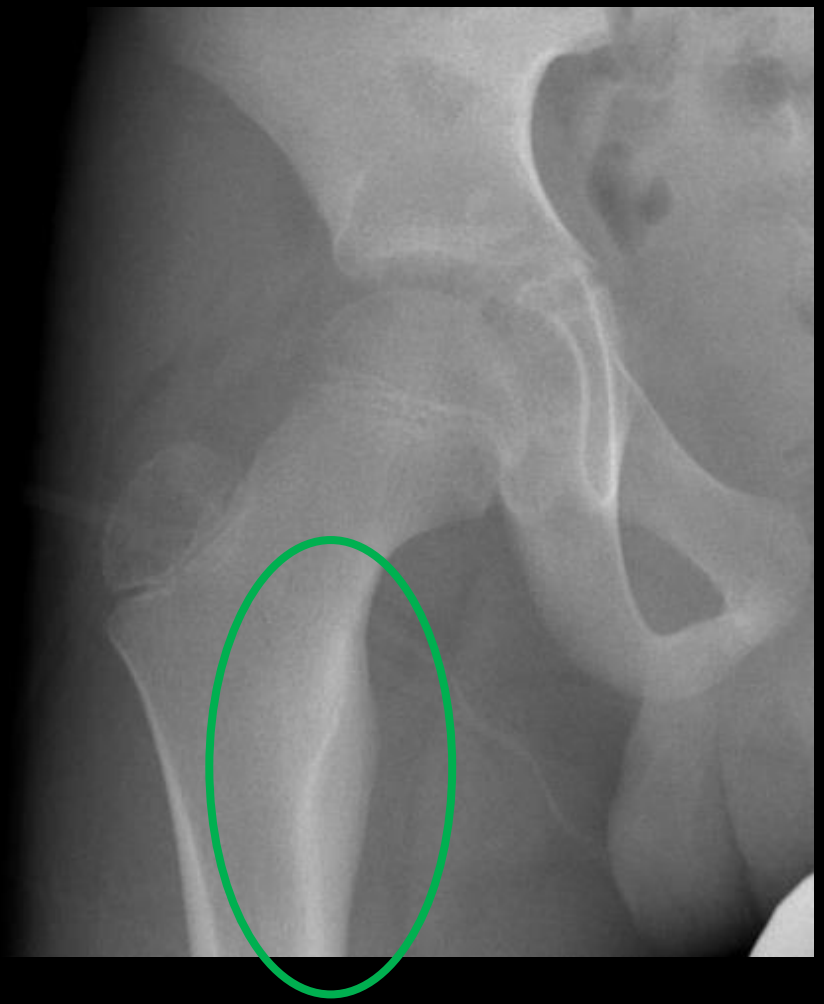
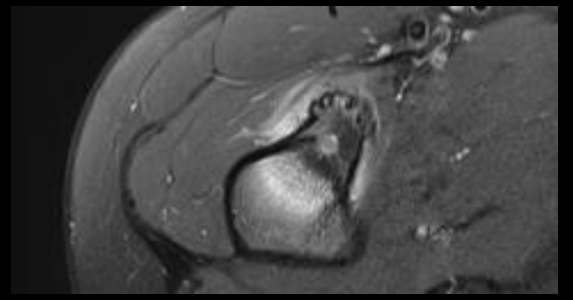
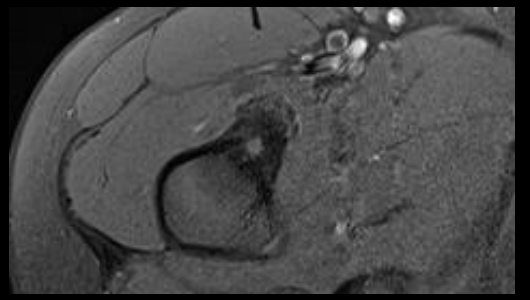
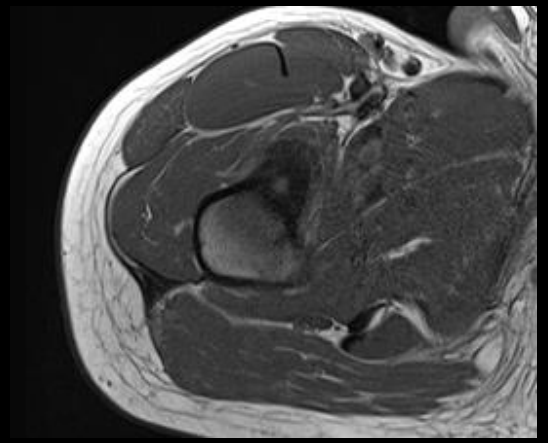








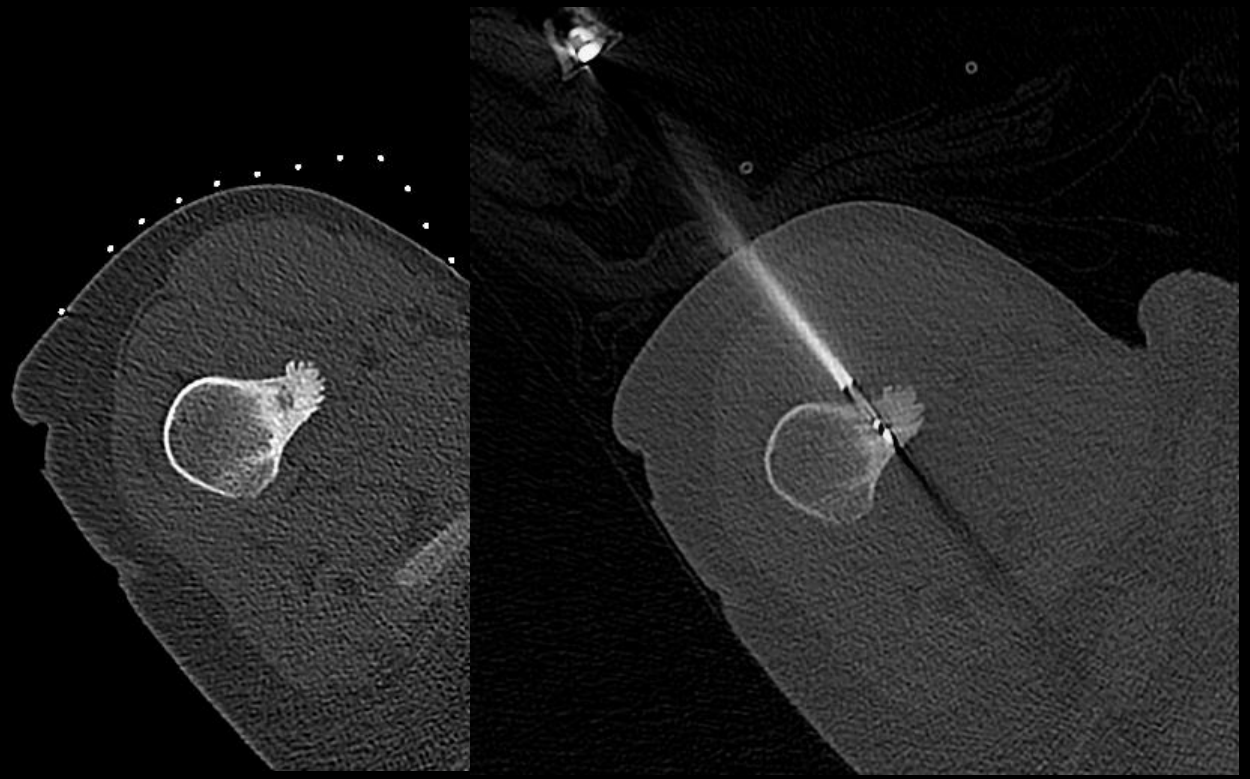
Osteoid Osteoma

- First described in 1953, most common benign bone producing tumor
- Typically small, <1cm
- Nidus composed of osteoid within a vascular stroma, central mineralization
- Males > females, 2-3:1
- Pain, predominant at night, relieved by NSAIDS

Osteoid Osteoma Imaging Appearance

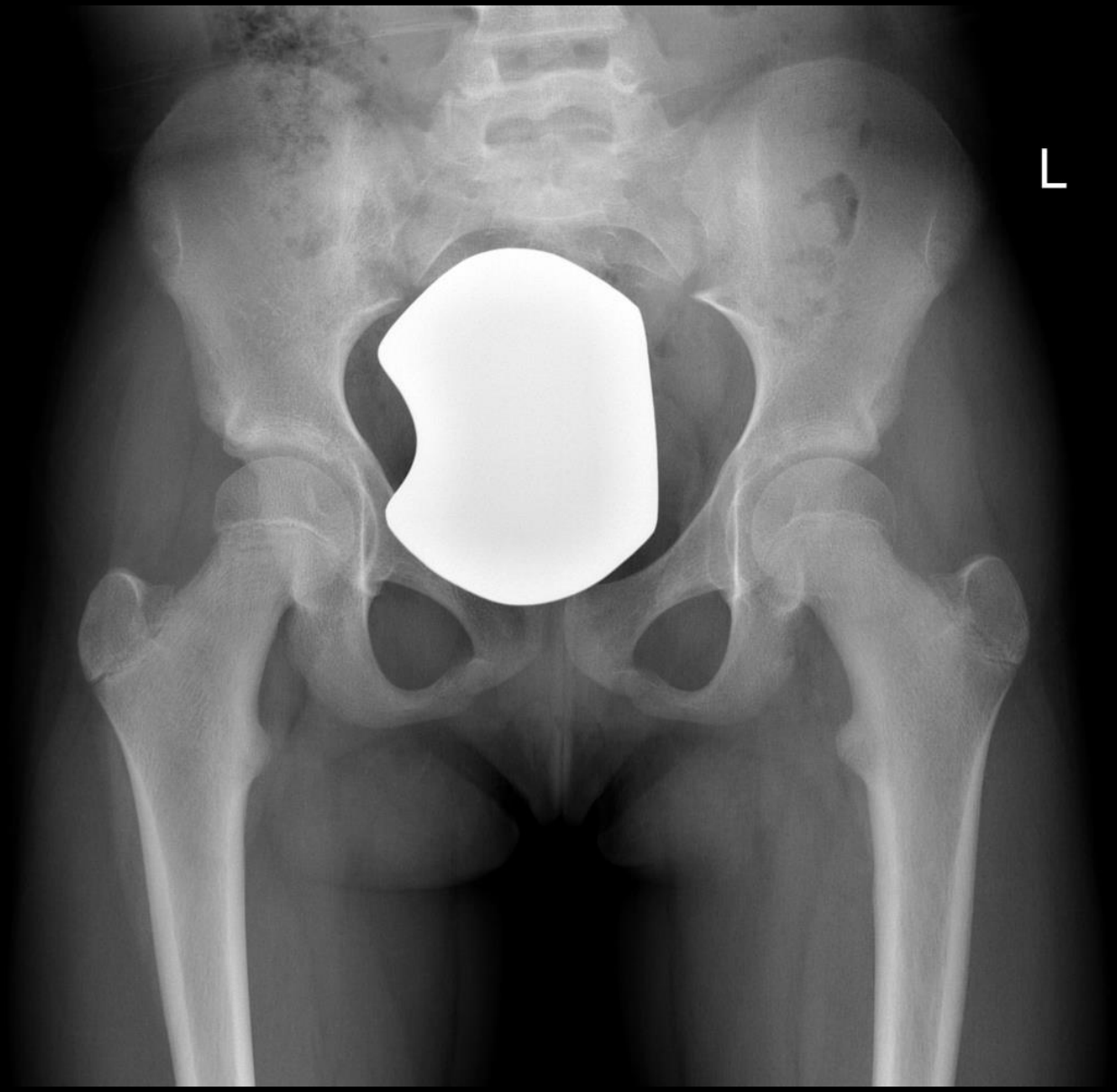
- Long bones most common, spinal 10%
  - Cortically based diaphyseal, metaphyseal
  - Intramedullary, subperiosteal, epiphyseal
- Increased vascularization and osteogenesis dictate its imaging appearance
- XR: Small round/ovoid lucent nidus, oblong thickening of a single cortex, nidus may be occult
- Bone scan: double density sign, intense uptake with surrounding halo
- CT: Well-defined round or oval lucent nidus with +/- central mineralization, surrounding sclerosis, vascular grooves
- MR: Sometimes fails to depict the nidus; intermediate SI on T1WI, variable T2, surrounding edema

Treatment: CT guided Radiofrequency ablation

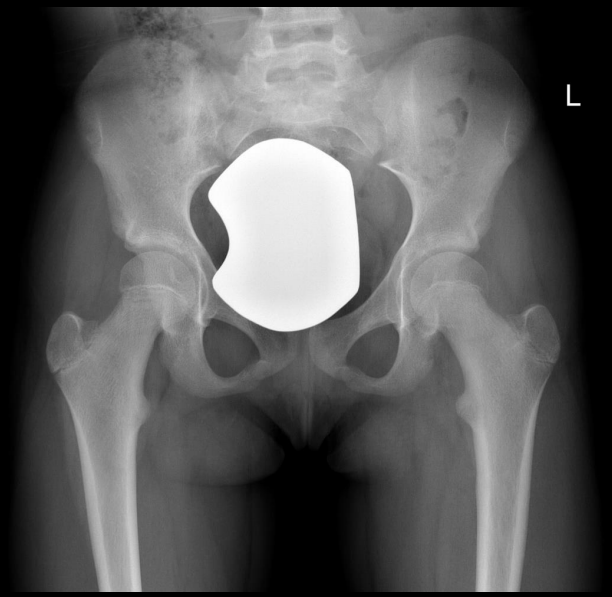


CASE 8

11 F with left hit pain and limp since injury 2 months ago



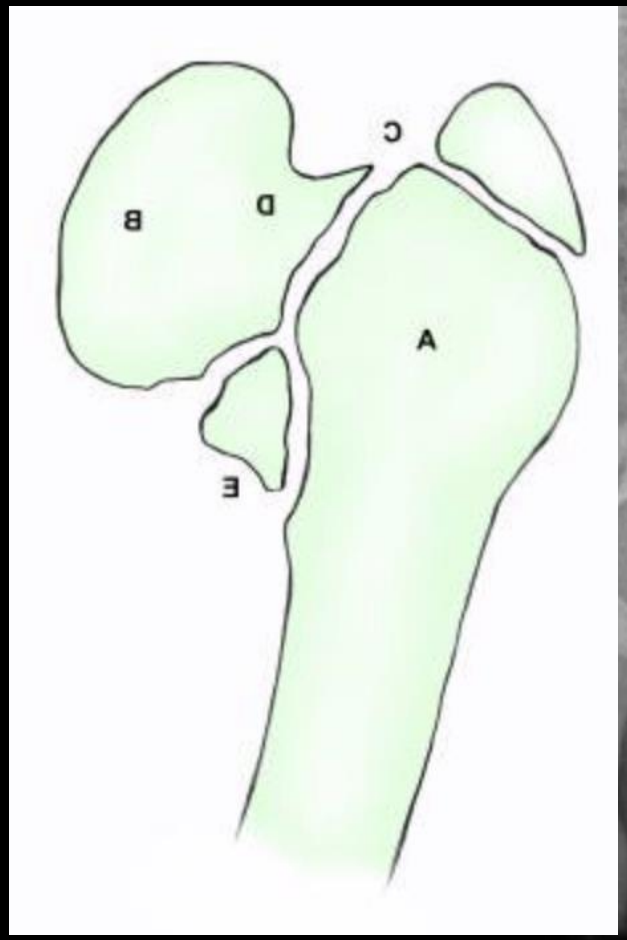
Valgus SCFE



- Rare
- Superolateral
- Increased lateral extension of the epiphysis past Klein's line
- Underlying coxa valga

Companion case: 10 year old Tanzanian boy hit by brother one year ago

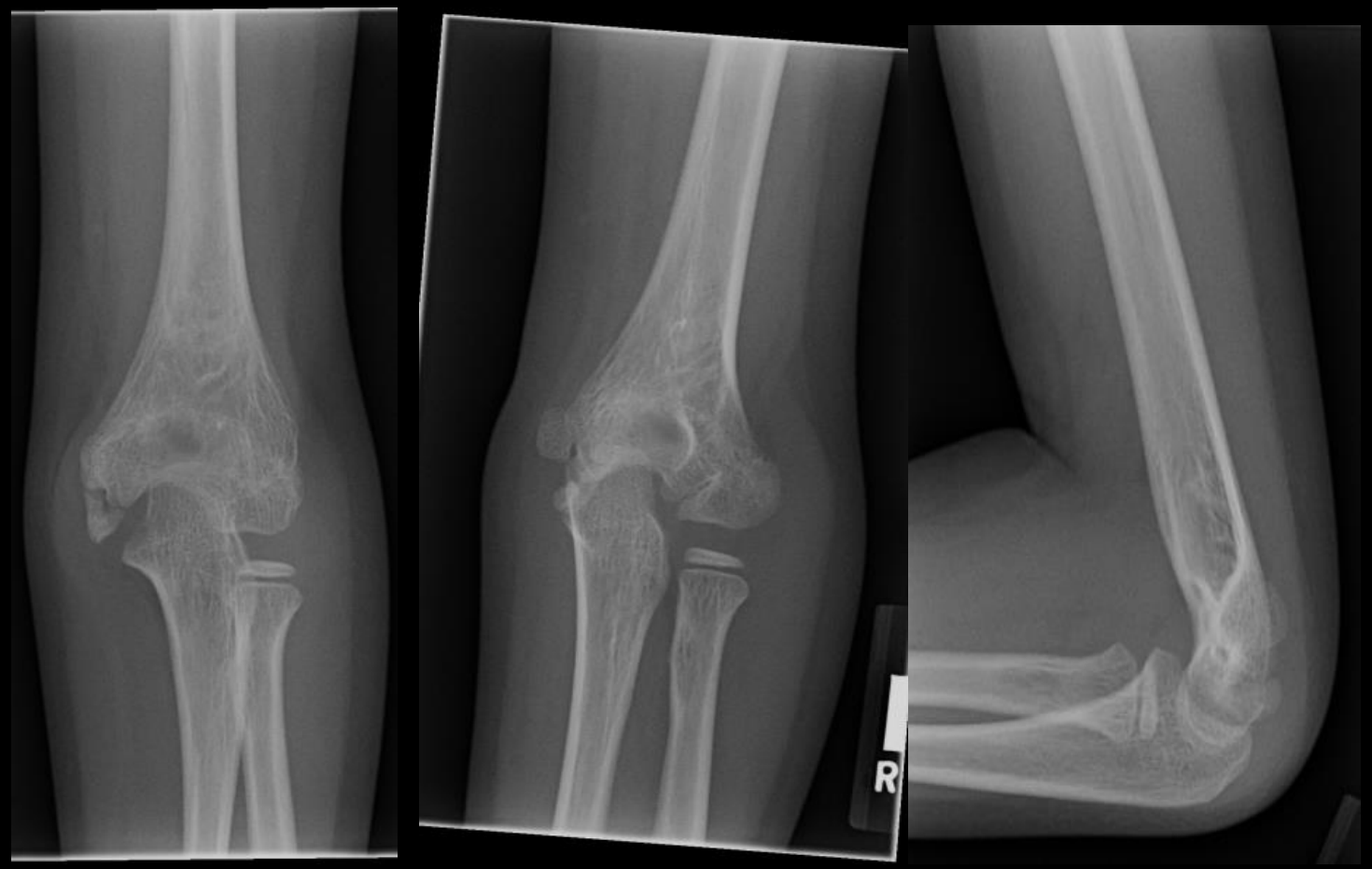
Coxa Vara



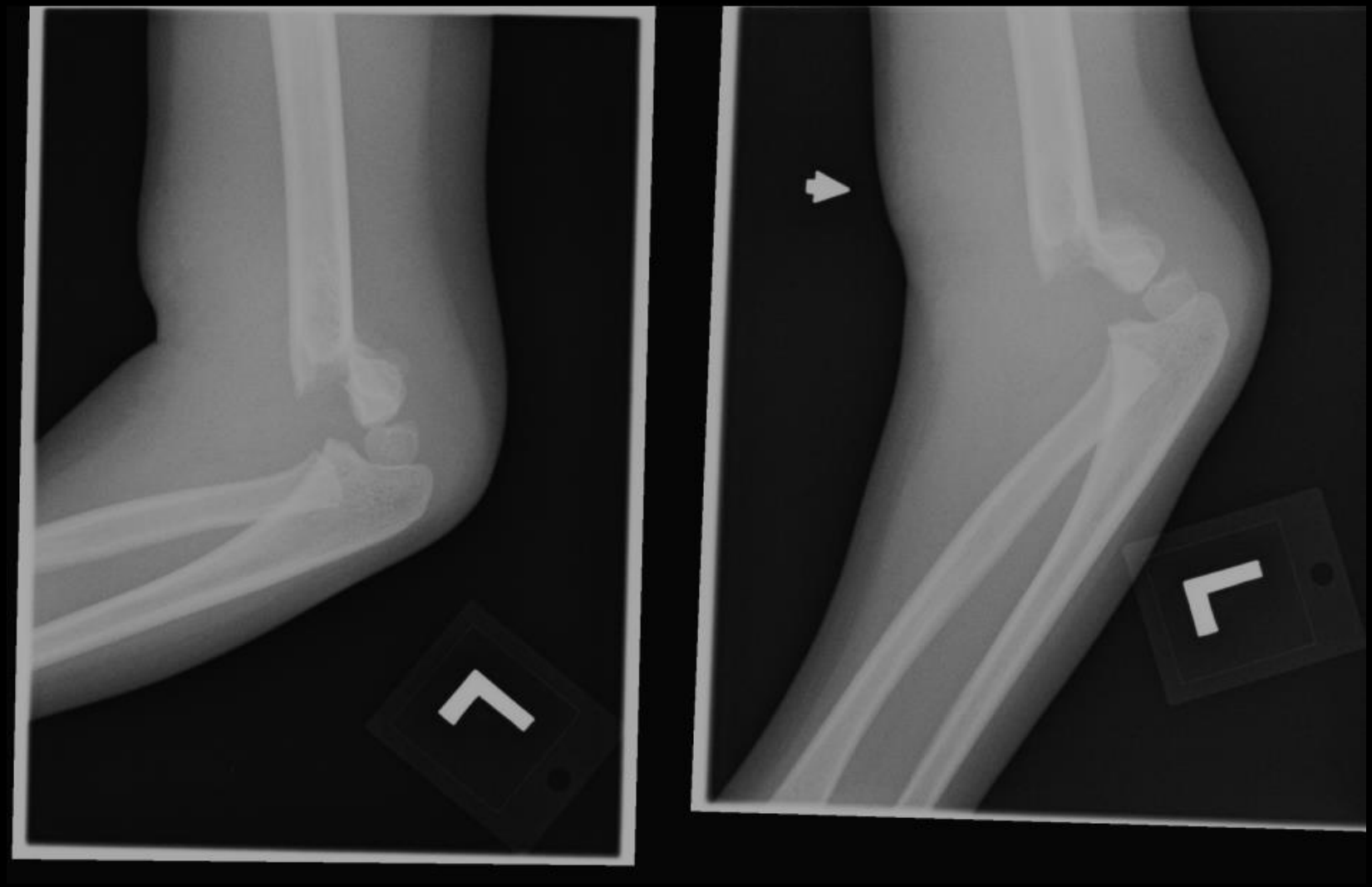
- Decreased neck-shaft angle
  - <120 degrees
- Congenital or acquired
- Bilateral in up to 50%
- ? Abnl medial physeal cartilage
  - Increased lateral growth
  - Vertical physis
  - Triangular inferomedial fragment
- Surgical treatment

CASE 8

9 year old male with elbow pain and limited ROM

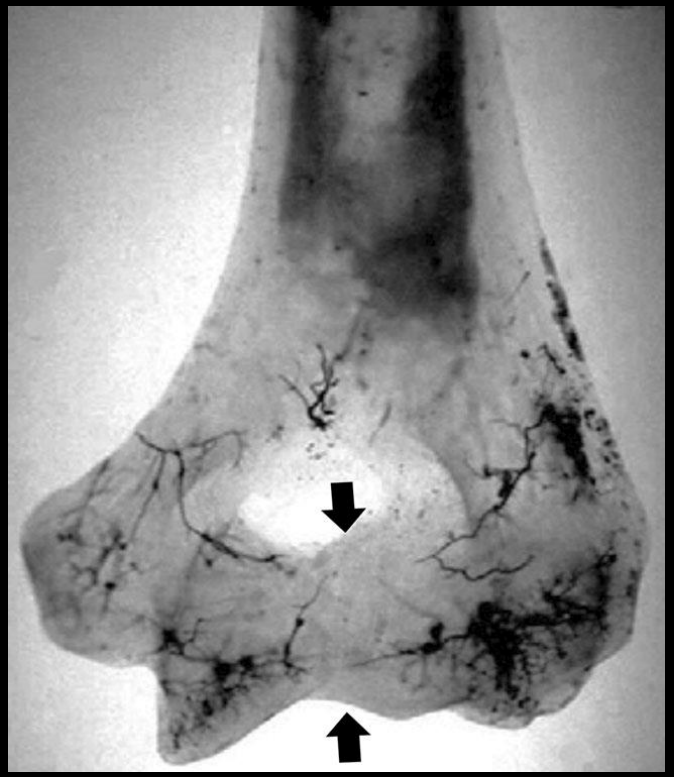


3 Years Prior



Fishtail Deformity

- Post-traumatic growth arrest/avascular necrosis of the lateral trochlea, resulting in abnormal development
- Trochlear ossification center has a tenuous blood supply
- Can be partial or total involvement-Type A involve lateral aspect of trochlea, Type B involvement of entire trochlea (Beaty and Kasser)
- Clinically manifests several years (2-7, avg 5 years) after a distal humerus fracture
- Most commonly status post supracondylar fractures

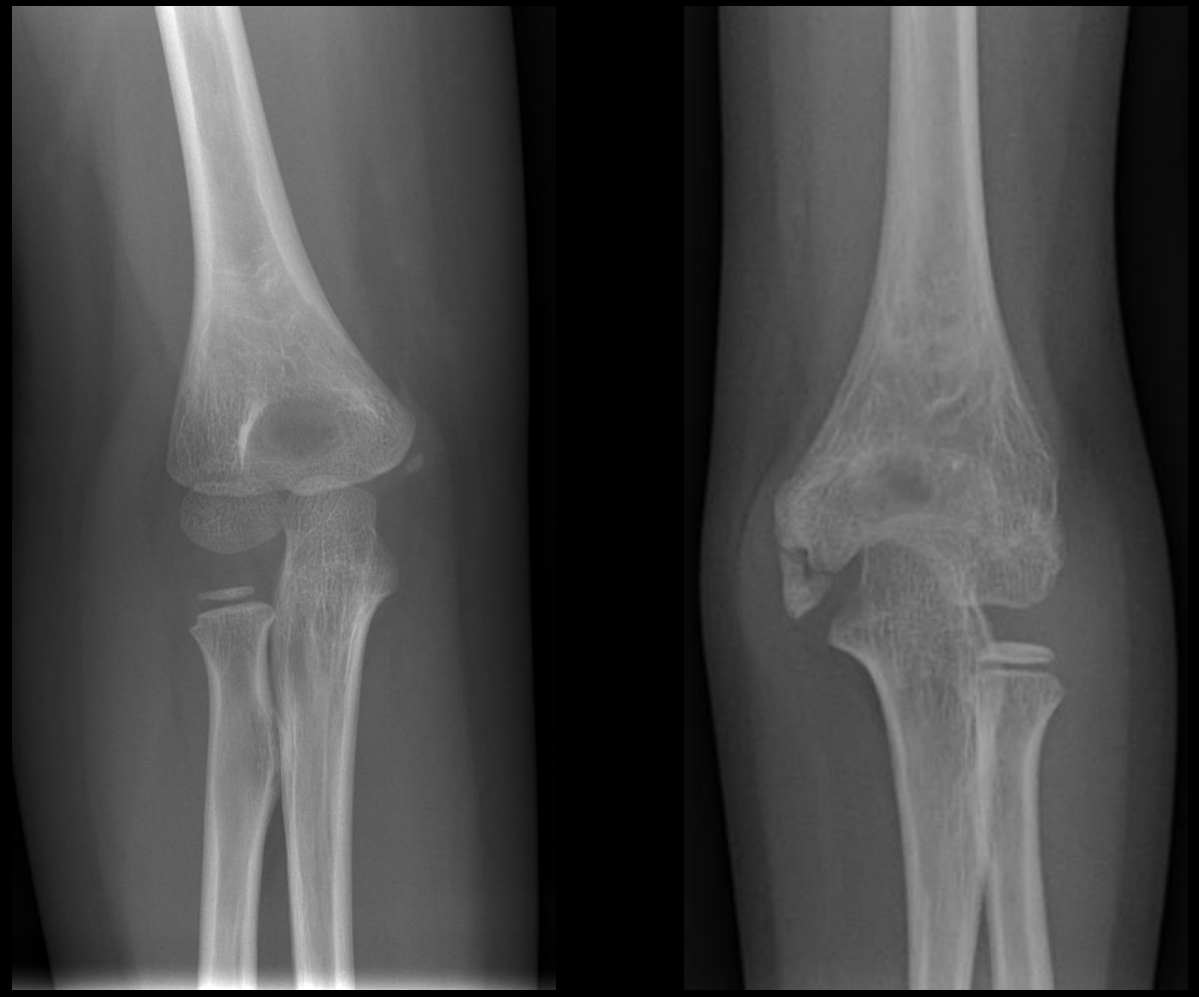


Kimball JP, Glowczewskie F, Wright TW (2007) Intraosseous blood supply to the distal humerus. J Hand Surg [Am] 32:642–646

Fishtail Elbow

- Limited flexion and extension
- Chevron/Fishtail sign on radiographs
- Subject to osteoarthritis, loose bodies, cubitus valgus deformity, proximal migration of the ulna, radial subluxation

Treatment
- Variable
- Conservative
- Debridement with removal of loose bodies, capsulotomy, epiphysiodesis, osteotomy, ulnar nerve transposition, arthroplasty, grafting



Case 9

Adolescent male with thumb pain

Ewing’s sarcoma

- Aggressive, small round blue cell tumor
- Central diaphyseal ill-defined lucent lesion
- Permeative, moth-eaten
- Aggressive periosteal reaction
  - Sunburst, hair-on-end, Codman triangle, onion skinning
- Any bone

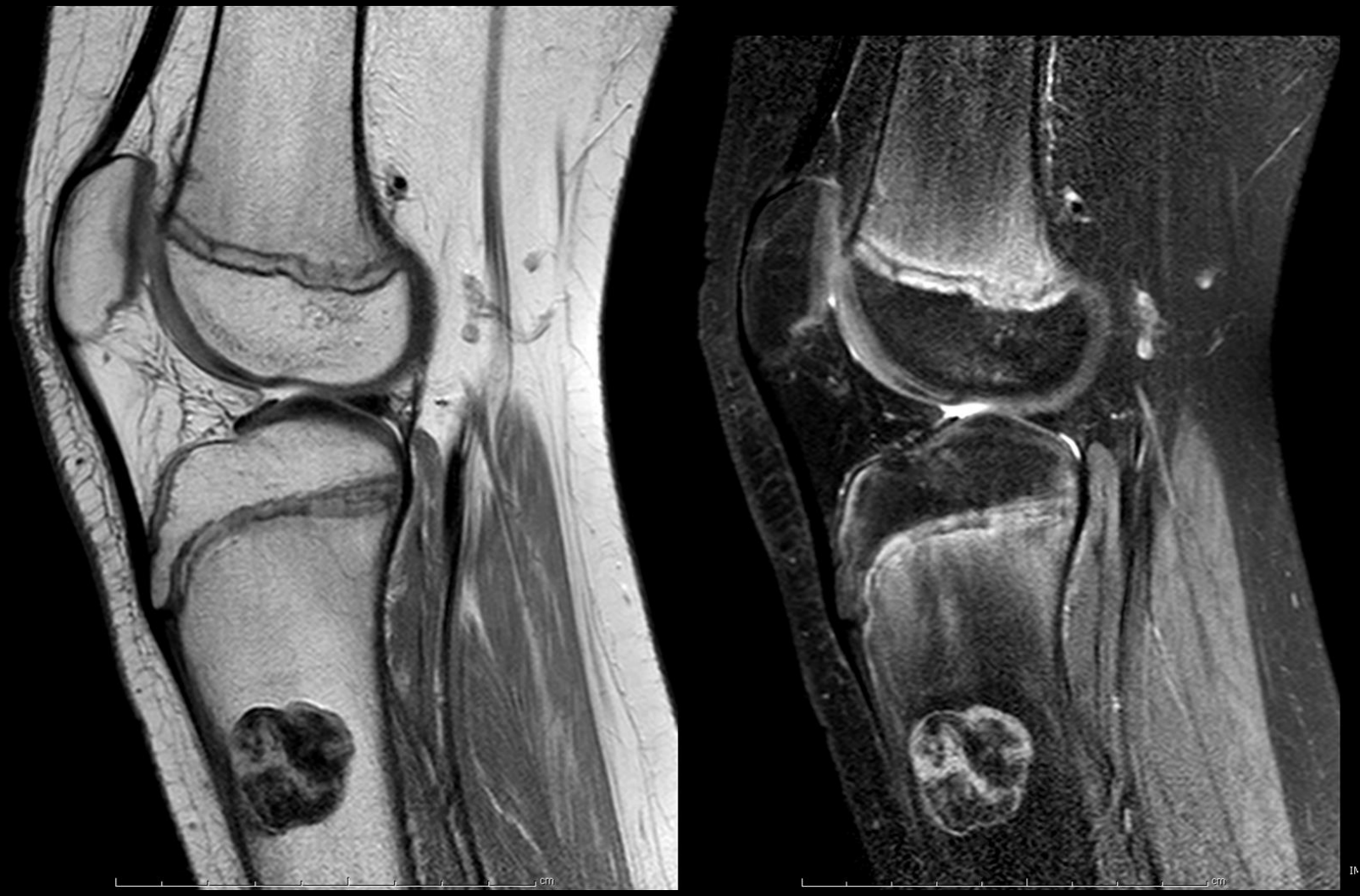
Case 10

11 yo M with weakness and pain


R
cm
IM: 8001


R
DDE

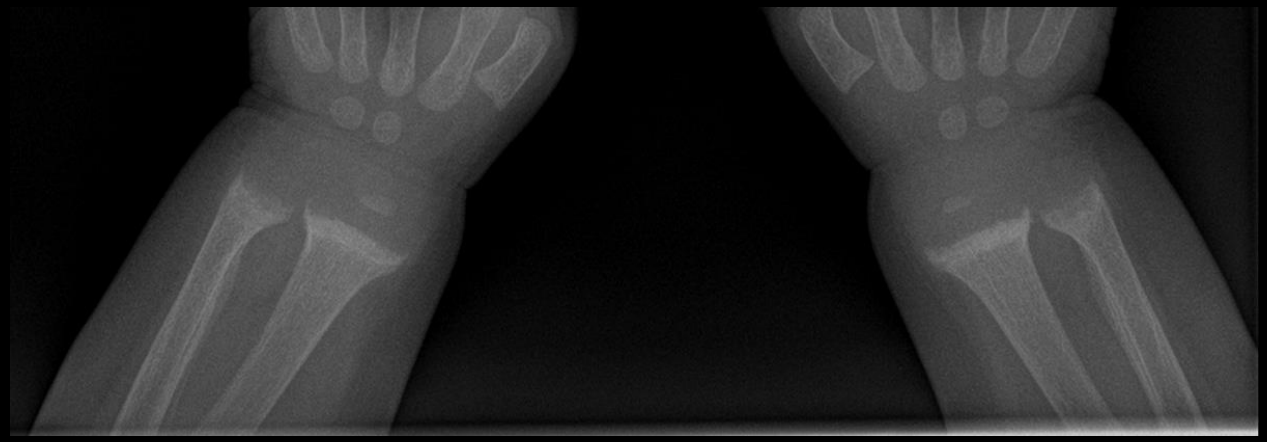

R
cm



Tumor-induced osteomalacia (oncogenic rickets)

- Paraneoplastic syndrome resulting in phosphate wasting
- Phosphaturic mesenchymal tumor
- Tx: surgical resection, good prognosis

Companion case: Rickets



- Vitamin D deficiency
- Failure to mineralize cartilage:
  - Prematurity, hypophosphatasia, dietary + sunlight deficiency, liver dz, renal failure
- Metaphyseal cupping, fraying and splaying
- At sites of endochondral bone formation
- Wide physis DDx: chronic trauma, infection, rickets, systemic illness, leukemia, skeletal dysplasia

Thank you!

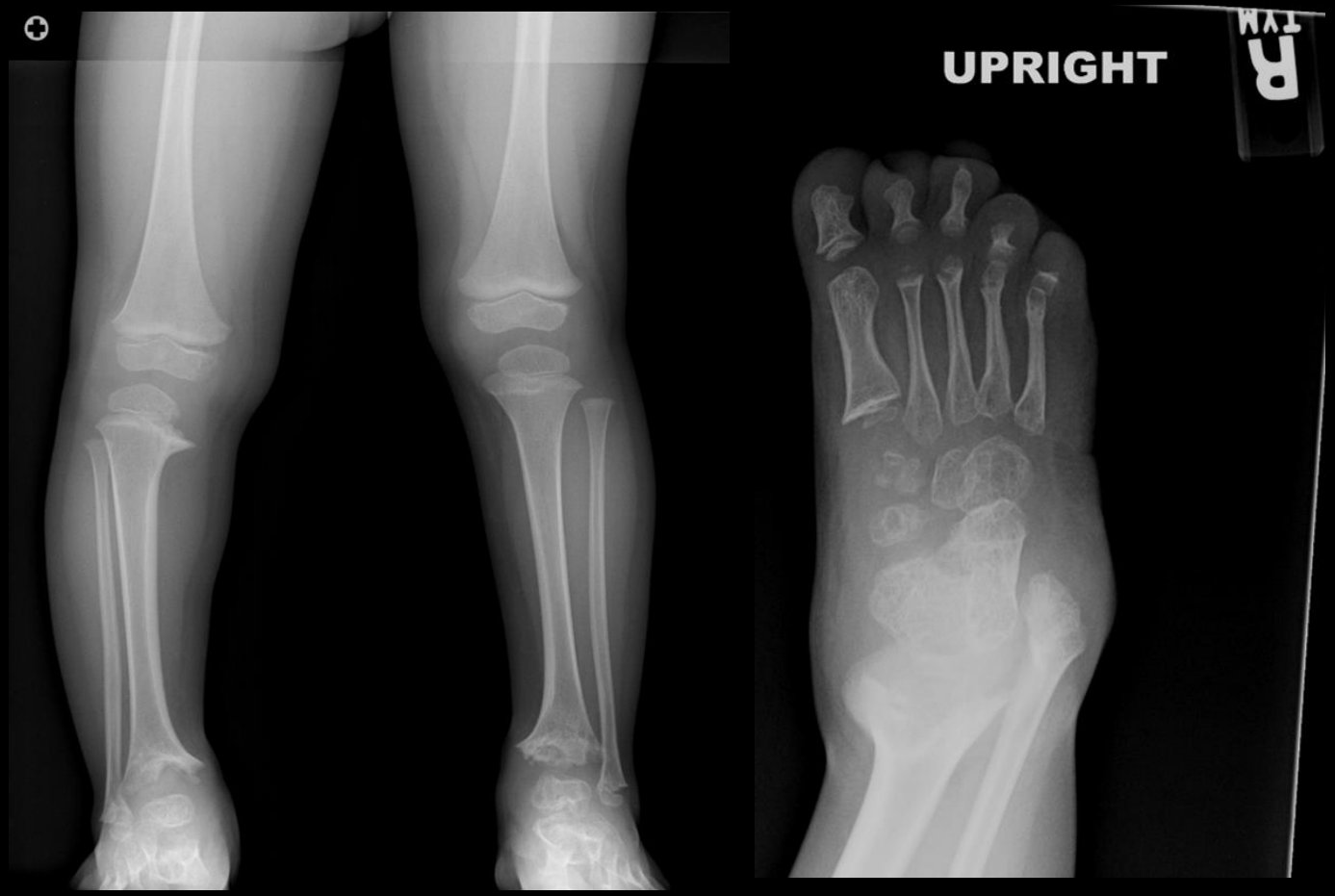
Mark.bittman@gmail.com

DRIVING CHANGE 2023


L
JAP
L
JAP

Trevor Fairbank Disease

- Synonyms: dysplasia epiphysealis hemimelica, Trevor disease, Fairbank disease
- Definition: osteochondroma involving 1 or multiple epiphyses
- Localized: 1 epiphysis, usually ankle
- Classic (2/3 of cases): > 1 epiphysis in same limb, usually medial knee and ankle
- Generalized: entire (usually lower) extremity
- Presentation
  - Limb length discrepancy (premature physeal closure)
  - Malalignment (usually varus/valgus)
  - Joint mass
  - Early osteoarthritis
- Demographics
  - Developmental; arises in childhood
  - M > F (3:1)
  - Rare: 1/1,000,000 population


UPRIGHT
R

Growth Disturbance 2° to Sepsis

- Meningococcemia (pneumococcal in this case)

- Growth disturbances
  - Lower extremity > Upper
  - Metaphyseal cupping
  - Physeal bars
    - Leg length
    - Angular

Bowing

- Bowing of the lower extremity is a common referral to pediatric orthopedic clinic
- Differential Diagnosis:
  - Physiologic bowing
  - Blounts
  - Physeal Distrurbance (trauma, infection, etc.)
  - Metabolic bone disease
  - Skeletal dysplasia

LCP Mimic: Meyer's Dysplasia

2.5 year-old with right hip abnormality seen on abdominal radiograph **asymptomatic**

Meyer's Dysplasia vs LCP

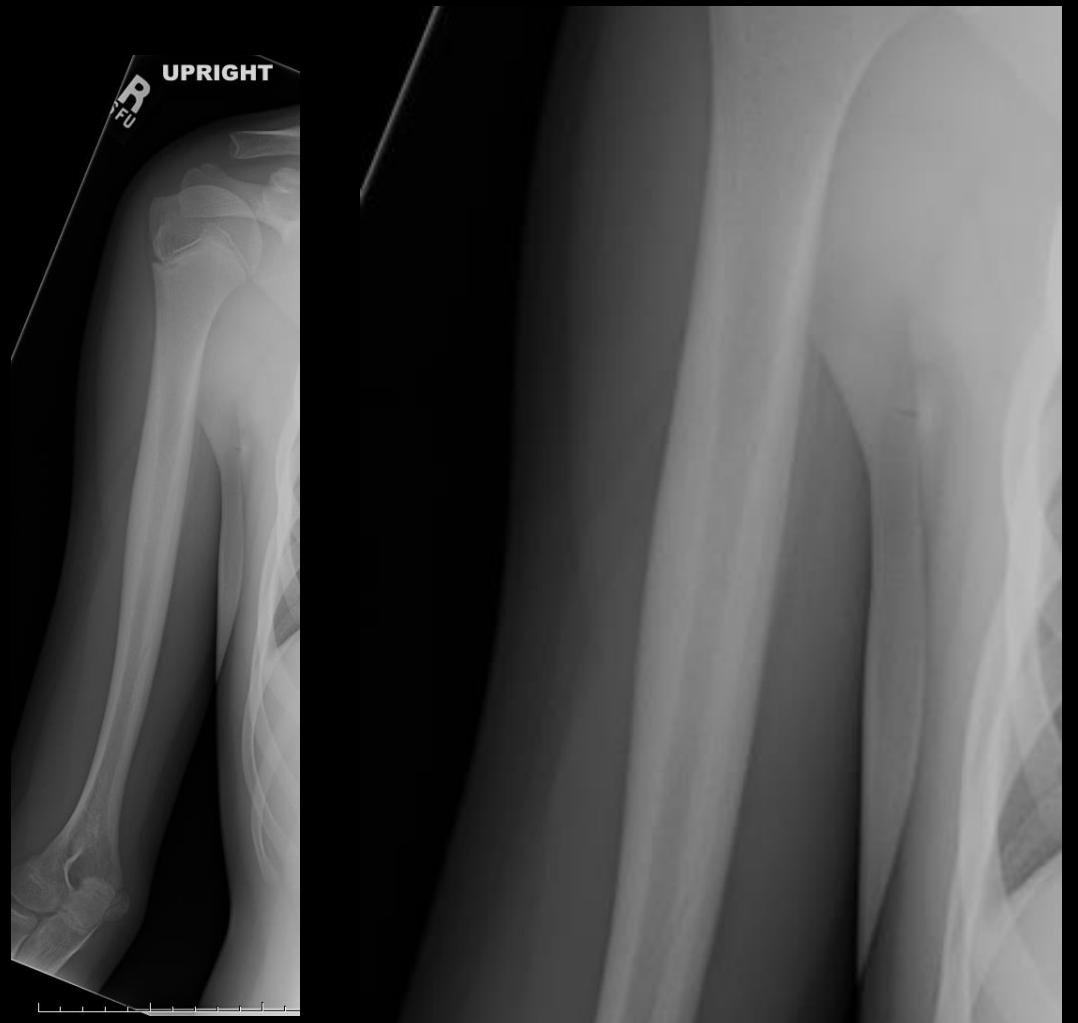
Meyer's Dysplasia

- Asymptomatic irregularity, usually incidental
- <4 yo
- 50-60% bilateral
- MRI: nl signal in fragments
- Good prognosis
- No treatment required

Perthes

- Limp, pain
- 4-8 yo
- 10-20% bilateral
- MRI: abnl
- Prognosis depends on various factors

LCP Mimics: Spondyloepiphyseal Dysplasia & Multiple Epiphyseal Dysplasia (MED)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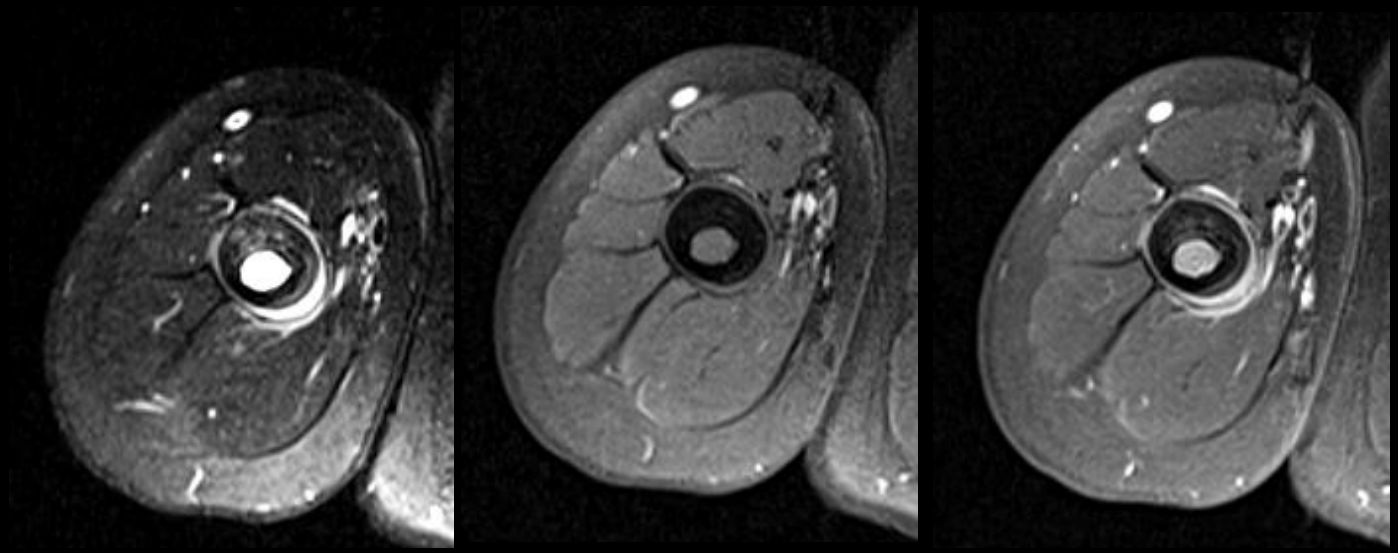
UPRIGHT



What is the most common site affected by CRMO?

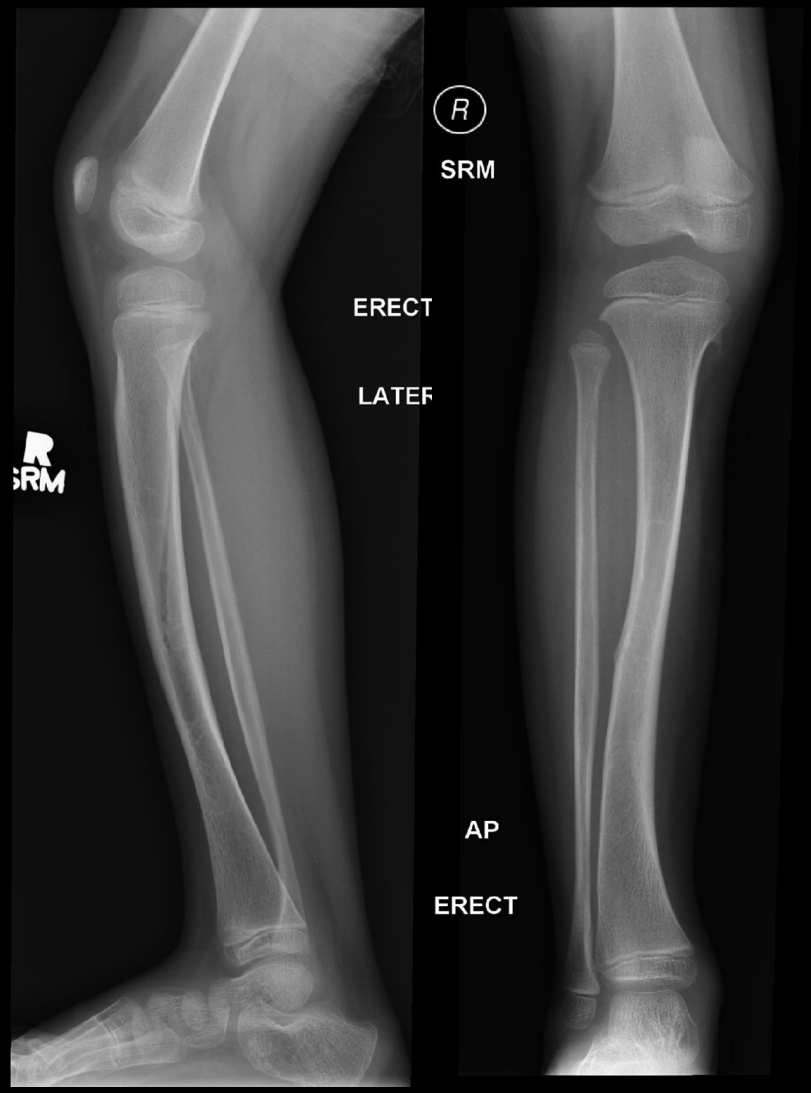
- A. Long bone metaphyses
- B. Long bone epiphyses
- C. Diaphysis
- D. Cervical spine
- E. Lumbosacral spine

CRMO

- Children and adolescent
  - Median age of 10 years, F>M
- Insidious onset of pain and swelling x years
  - +/- systemic symptoms, skin disorder
- Metaphyses of tubular long bones > clavicle > spine
  - multifocal
- Dx of exclusion
- Tx: NSAIDS, steroids, TNF alpha

Chronic Recurrent Multifocal Osteomyelitis (CRMO)

- DDx:
  - Bacterial subacute or chronic osteomyelitis
  - Ewings sarcoma
  - Leukemia or Lymphoma of bone



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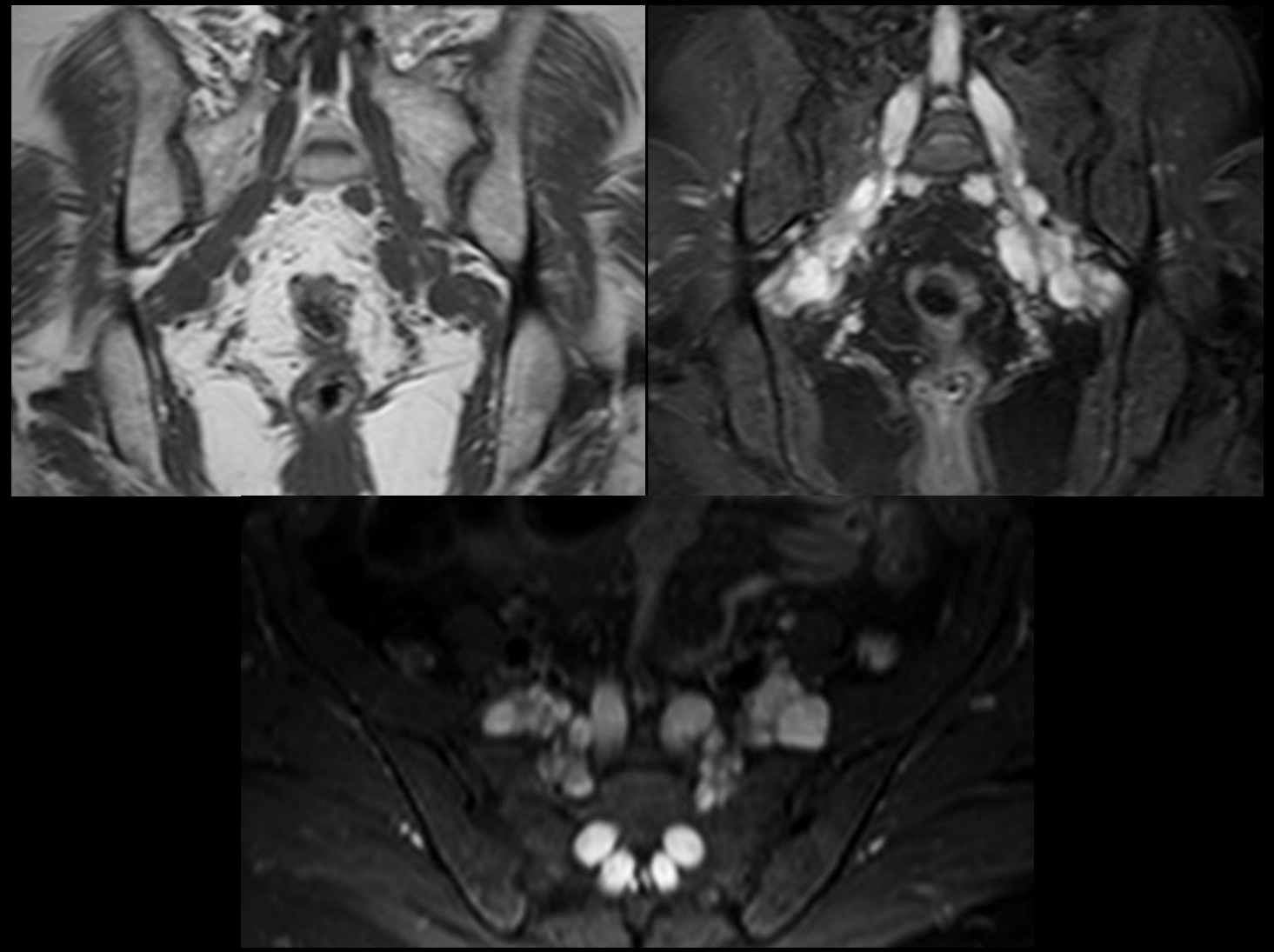
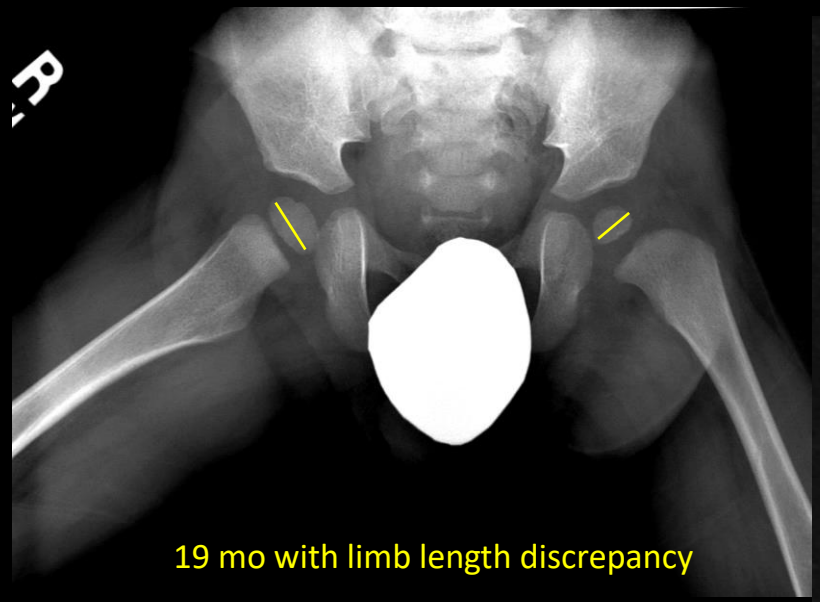


NF1

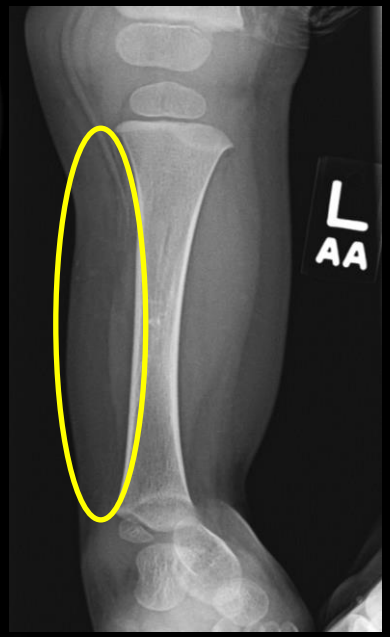
- Anterolateral bowing
- □ nonunion fracture/pseudoarthrosis

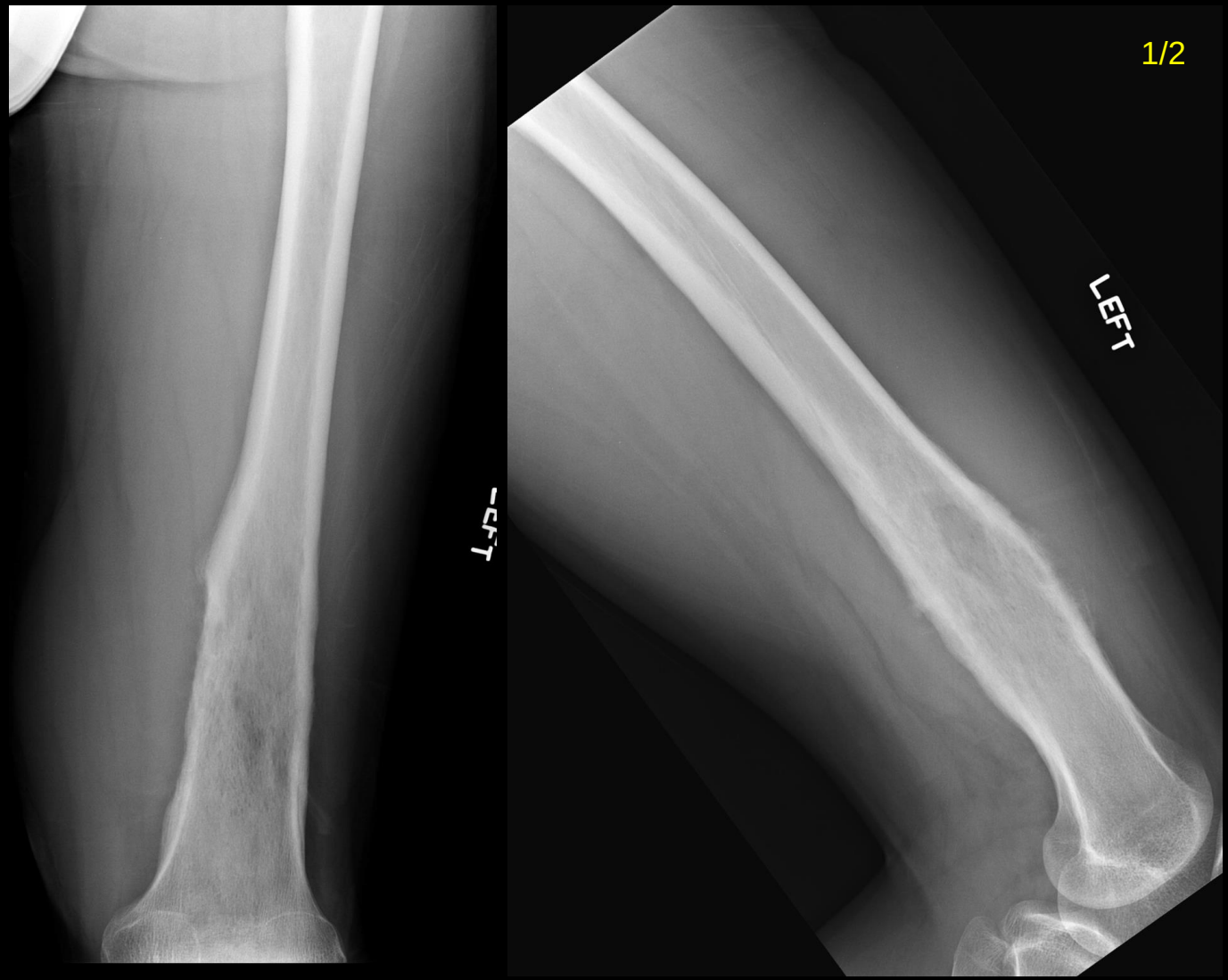
Proximal Focal Femoral Deficiency (PFFD) &

Fibular Hemimelia (FH)



19 mo with limb length discrepancy

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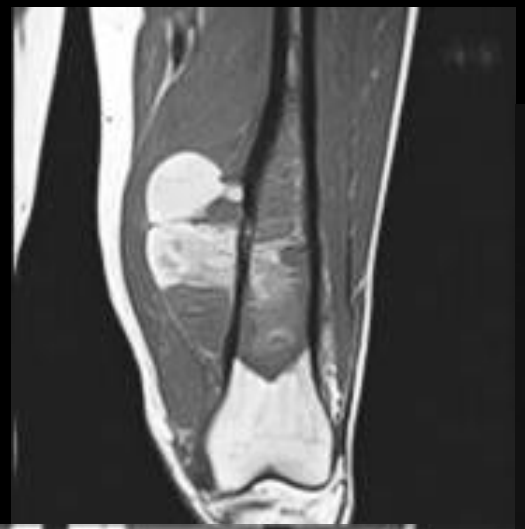
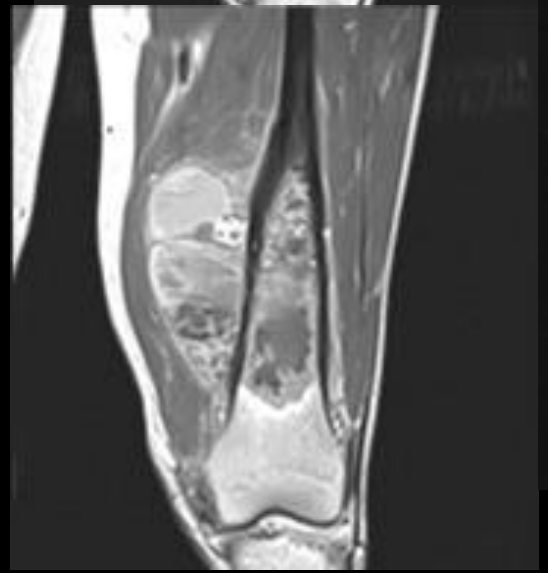
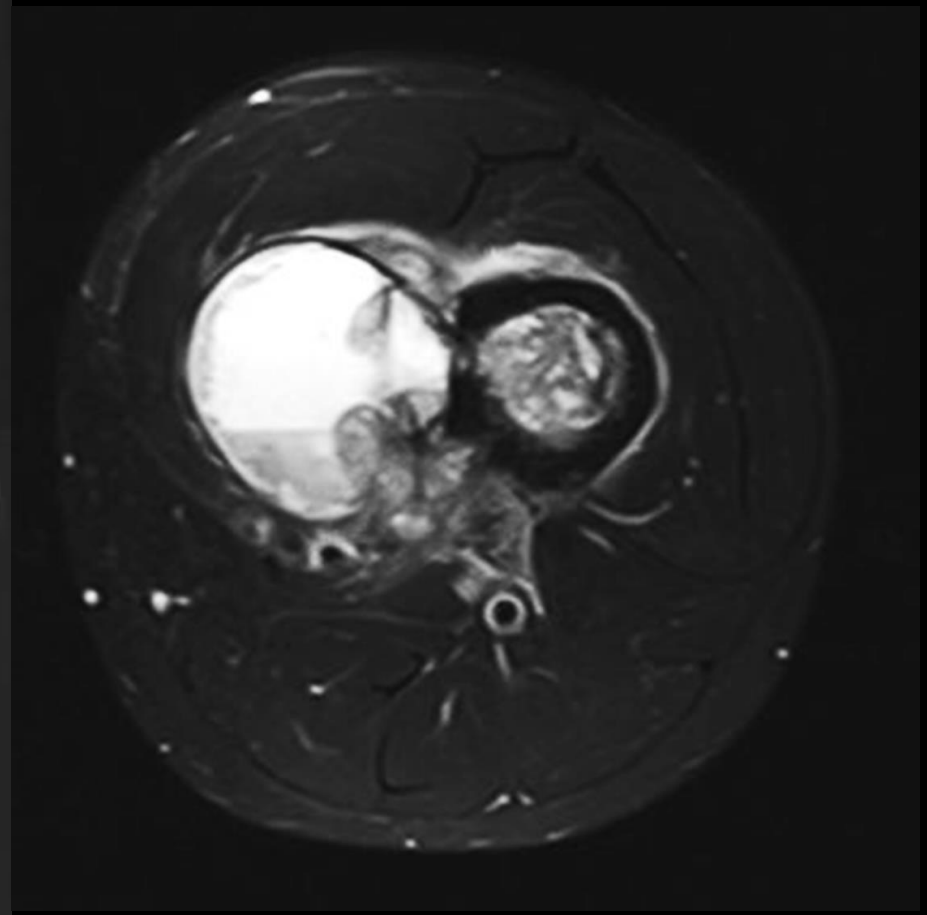
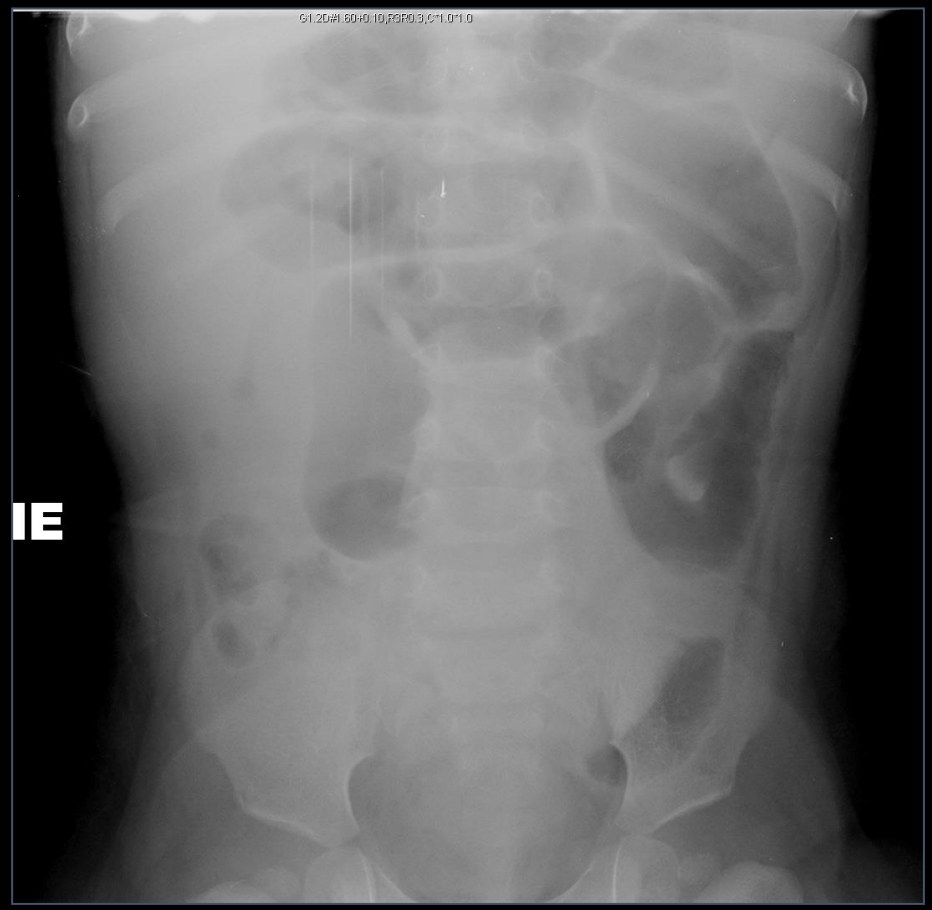






Telangiectatic osteosarcoma

- Rare osteolytic variant of OS
- Distal femur/prox tibia are MC
- Moth-eaten, permeative, wide zone of transition, aggressive perisoteal rxn
- MRI: fluid-fluid levels, heterogeneous, enhancing nodular components



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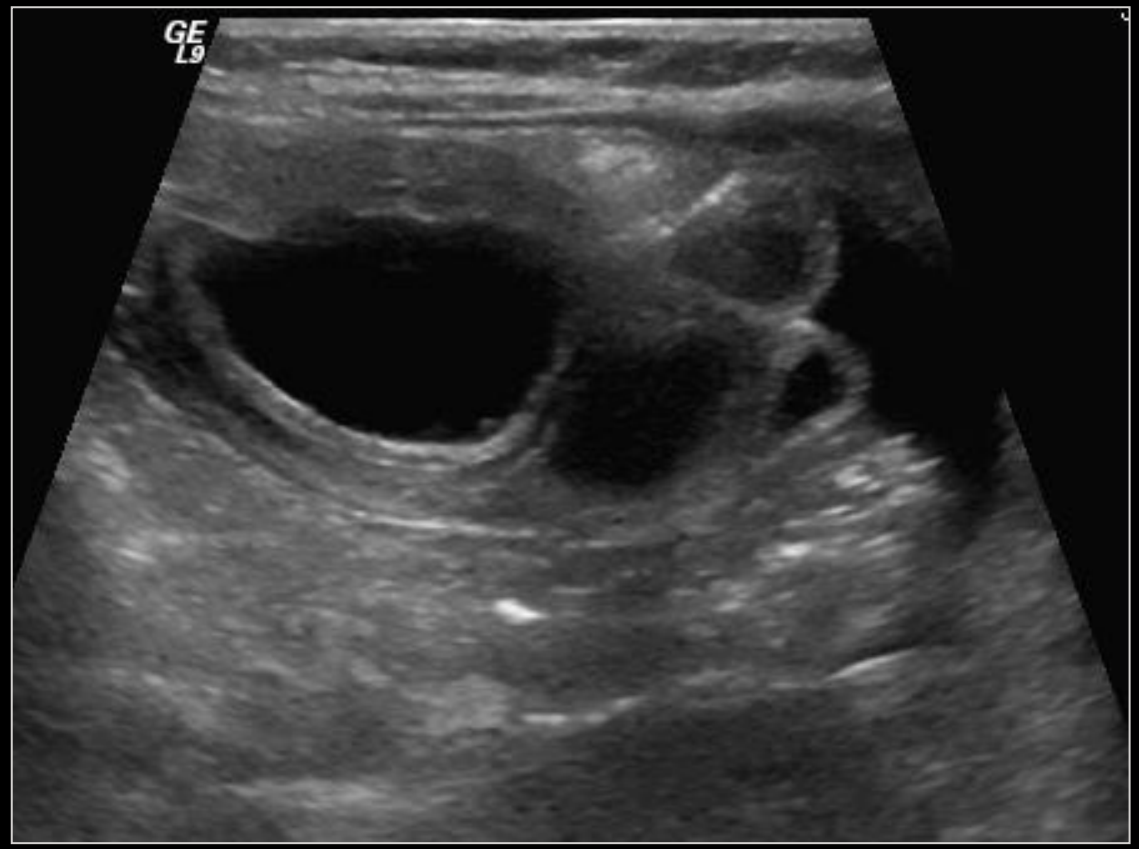
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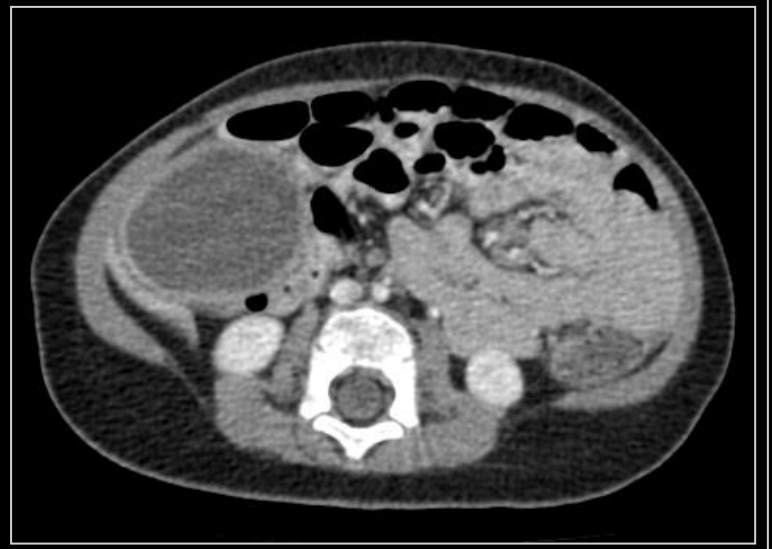
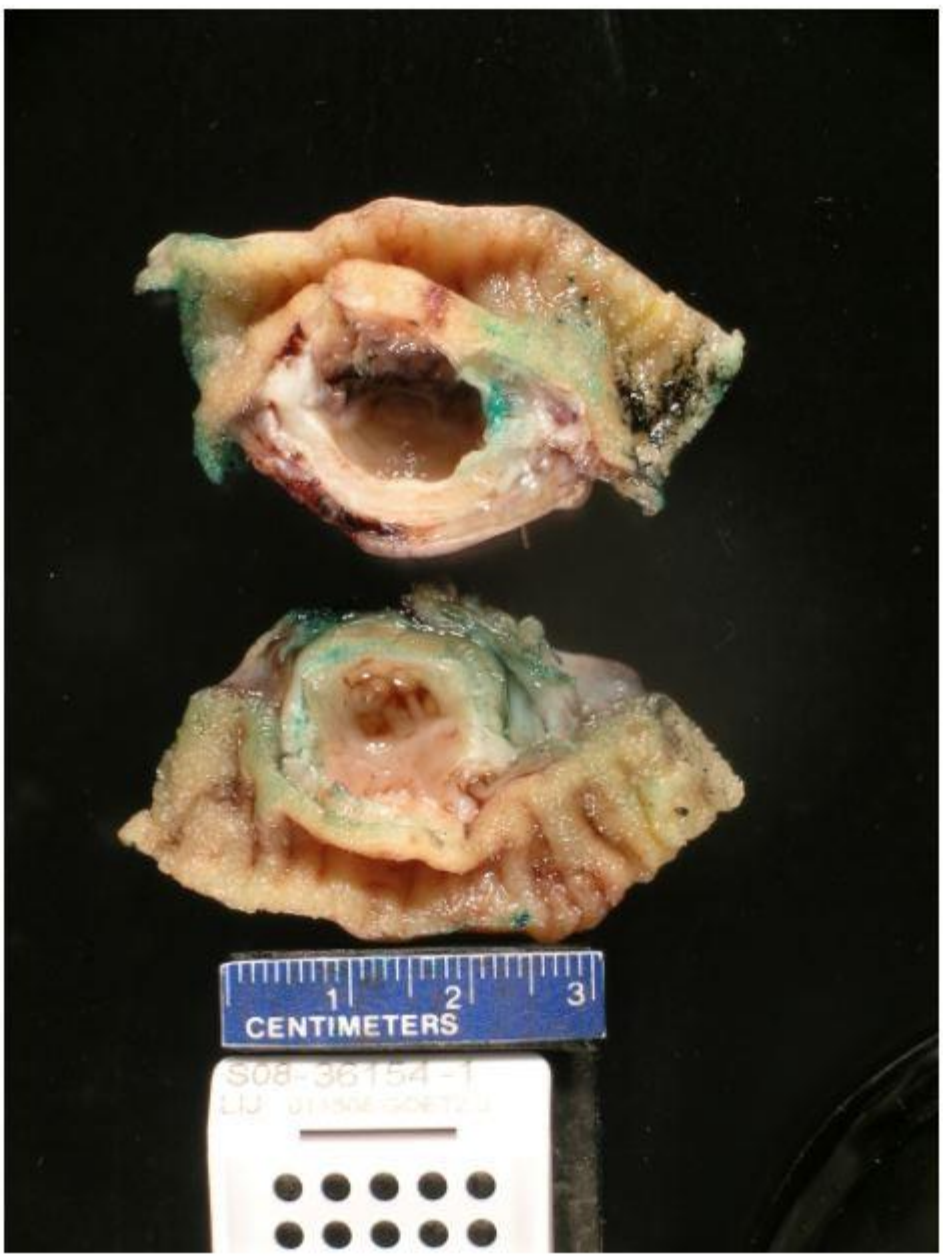
L9

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2
3
CENTIMETERS

Enteric Duplication Cyst

- Can occur anywhere (mouth to anus), ileum is MC
- Classic U/S appearance, muscular rim sign
- Cx:
  - Intussusception
  - Obstruction
  - Volvulus
  - Hemorrhage
  - Ulceration/perforation
  - Malignancy (rare)
- Sx treatment

Session Evaluation

DRIVING CHANGE 2023
THE URGENT CARE CONVENTION

- Your feedback is valuable, take a moment to complete the survey for this session.
- To claim CME, you must complete a separate survey available after the convention.