



WHAT'S WRONG WITH THIS PICTURE?

Common Radiology Cases

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OBJECTIVES:

- 1. Review anatomic landmarks of the upper and lower extremity joints on imaging.**
- 2. Recognize and describe abnormal imaging findings for urgent and emergent orthopaedic conditions.**
- 3. Engage in the diagnostic process of fractures and other musculoskeletal conditions.**
- 4. Determine clinical and radiographic indications for advanced musculoskeletal imaging and discuss anticipated findings based on presumptive diagnosis.**
- 5. Differentiate imaging features consistent with benign versus malignant bone tumors and lesions.**

MUSCULOSKELETAL IMAGING

Choice of Imaging:

1. Clinical presentation: history, MOI, location of pain
2. DDX
3. Availability of imaging modalities

Guidelines for Imaging:

[ACR Appropriateness Criteria](#)

Plain radiographs is the initial imaging of choice for most MSK conditions

“ONE VIEW IS NO VIEW”

Principle Views

- **Posterior/Anterior (PA) or Anterior/Posterior (AP)**
- **Lateral**
- **Obliques**
- **Supplemental views may be needed: specific to site**

CASE #1



CASE #2



FRACTURE DESCRIPTION

Clinical Presentation is Key:

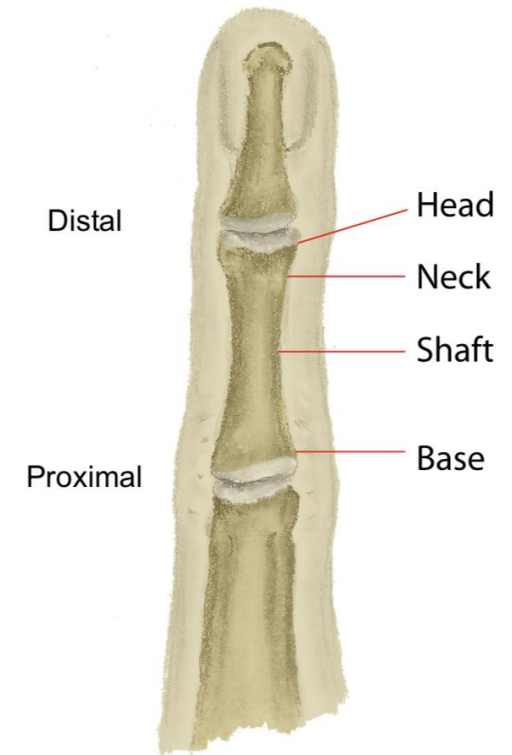
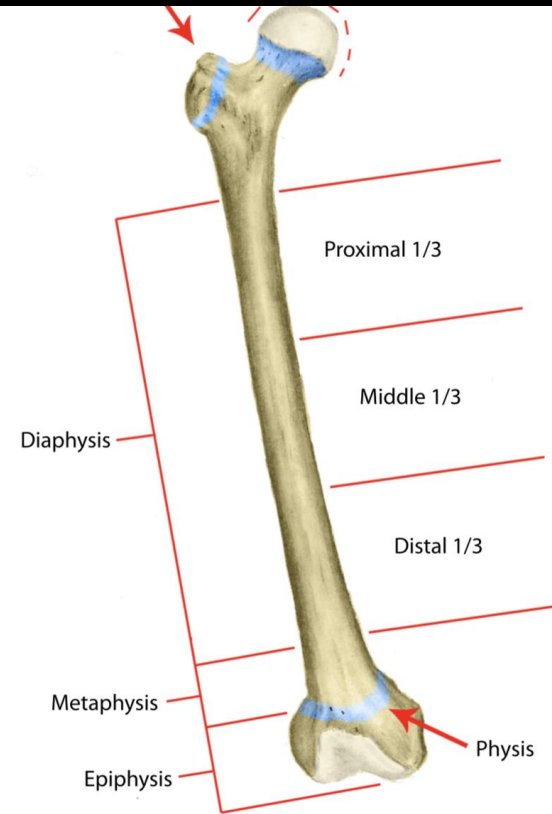
- Always evaluate the joint above, joint below, and contralateral side.
- Let exam findings and MOI guide your imaging.
- If open fracture, start with this description!

LOCATION

Which bone?

Where in the bone?

Joint involvement?



Illustrations by Sandra Ehler. Reproduced with Permission.



CASE #3



CASE #4

PATTERN

Complete: transverse, oblique, spiral

Incomplete: greenstick, torus, bowing

Unique pattern considerations: compression, impaction, avulsion, stress



Transverse

Oblique

Spiral



Bowing

Greenstick

Torus

PEDIATRIC PERIOSTEUM

**Metabolically
more active**

- Promotes callus formation
- Remodeling ability

**Thicker and
more
durable**

- Less likely to displace
- Unique patterns:
 - Buckle/torus
 - Greenstick
 - Plastic deformity/bowing



CASE #5



CASE #6

Case courtesy of Dr Yair Glick, Radiopaedia.org, rID: 61659



TYPE I

TYPE II

TYPE III

TYPE IV

TYPE V

S

A

L

T

R

SALTER-HARRIS CLASSIFICATION

CASE #7



CT VIEWS

Interpretation:

Right side of patient is left side of screen

Axial images: looking from patient's feet toward the head

Coronal: patient is facing you

Sagittal: Looking from the side

Planes:

Axial: horizontal slices (Divides Superior and Inferior)

Coronal: Longitudinal slice (Divides Anterior and Posterior)

Sagittal: Longitudinal slice (Divides Right and Left)

Density is similar to x-ray

- **IV contrast:** increase density differences

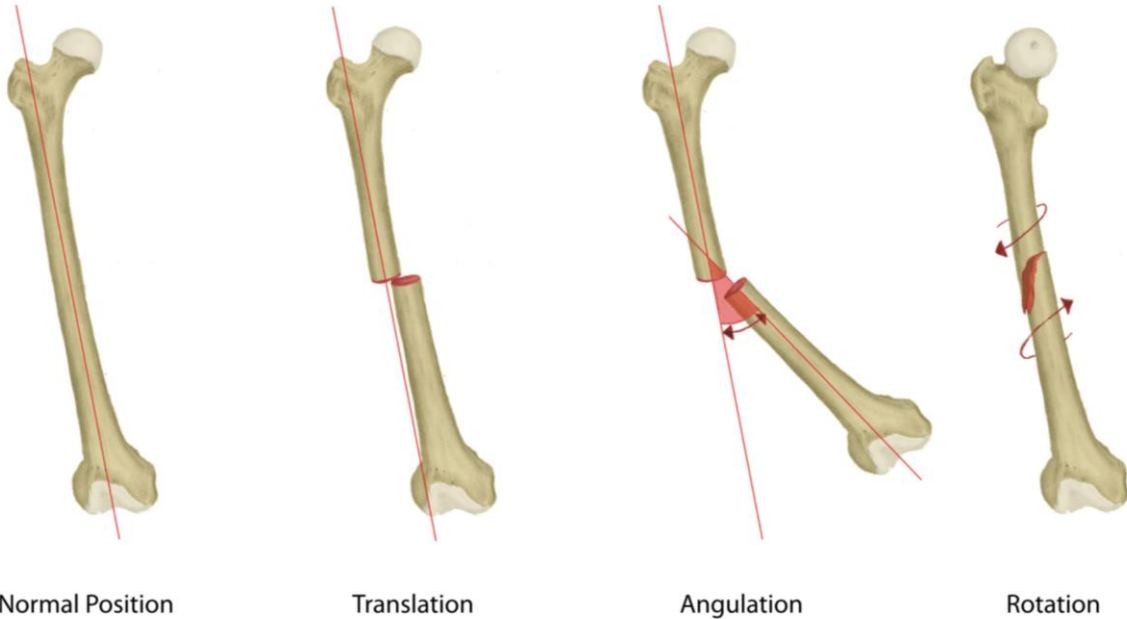
Typically, iodine-based



CASE #8



POSITION



Nondisplaced vs Displaced:

- Translation (Apposition)
- Angulation
- Rotation
- Shortening
- Distraction



CASE #9 AND #10

Case courtesy of Dr Bahman Rasuli, Radiopaedia.org, rID: 81113

Case courtesy of Dr Shailaja Muniraj, Radiopaedia.org, rID: 50051

CASE #11



Case courtesy of Townsville radiology training, Radiopaedia.org, rID: 17977

CASE #12



NUMBER OF FRAGMENTS

Simple

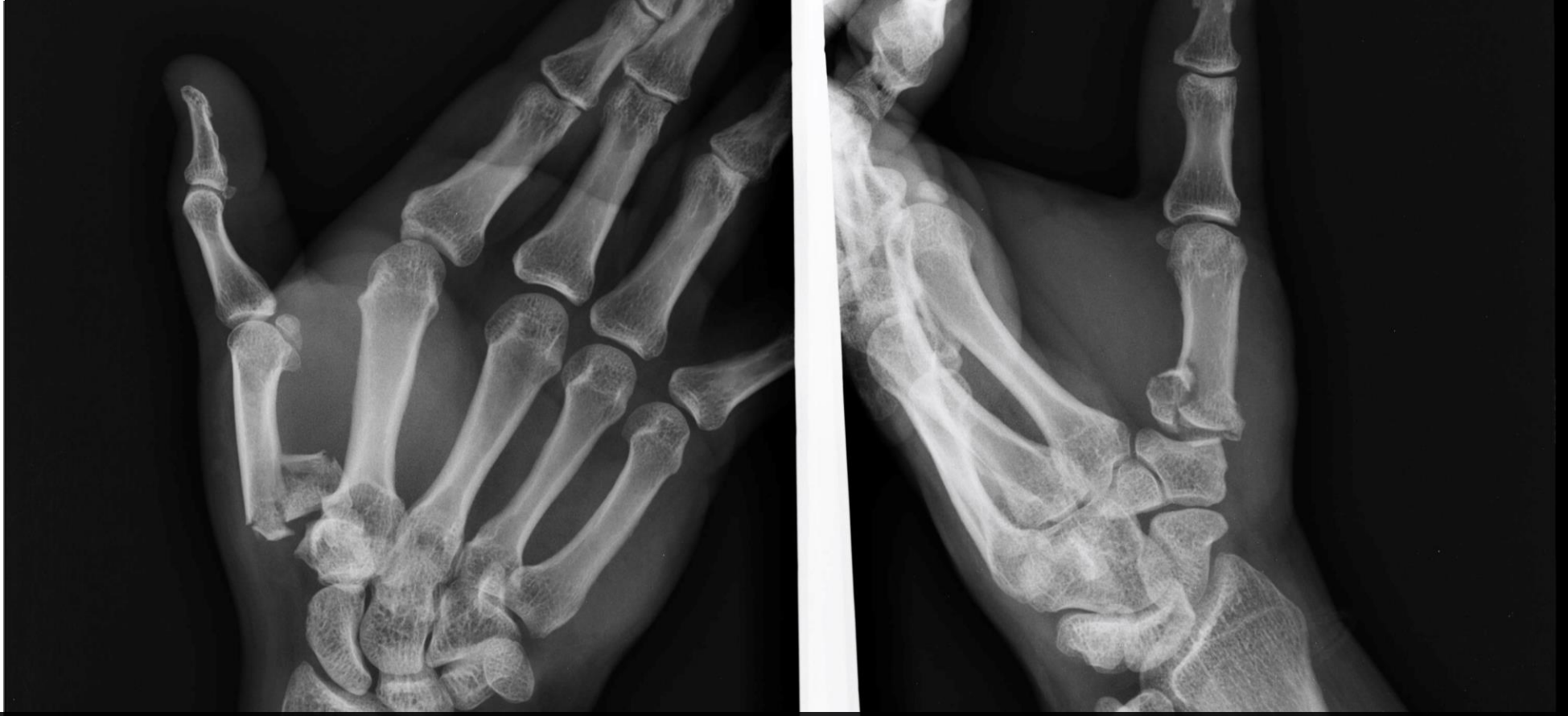
- **Two fragments**

Comminuted

- **More than two fragments**



CASE #13



CASE #14

CASE #15



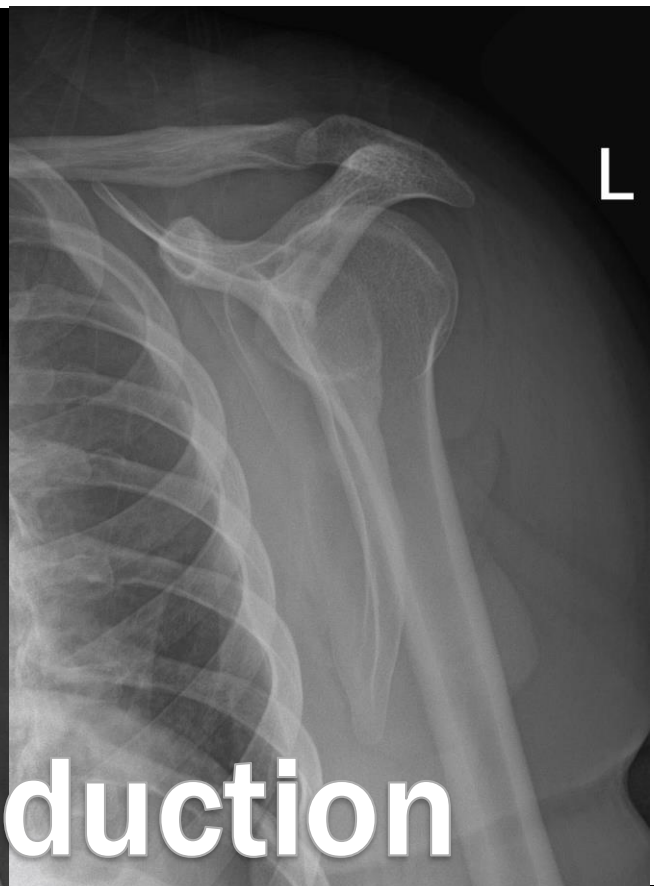
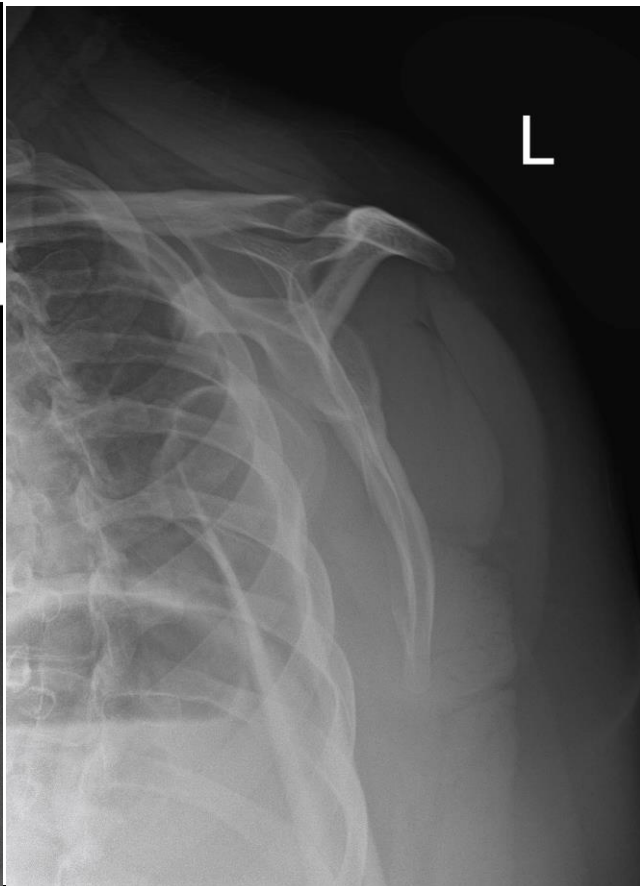
Classification Patterns	Symptoms	Imaging
Pre-slip	Pain present	Physeal widening (-) Displacement
Acute	Sx < 3 weeks Severe pain Limited ROM	(+) Joint effusion (-) Metaphyseal remodeling
Acute-on-chronic	Sx ≥ 3 weeks Acute increase in pain Decreased ROM	(+) Joint effusion (+) Metaphyseal remodeling
Chronic	Sx ≥ 3 weeks Vague, intermittent pain	(-) Joint effusion (+) Metaphyseal remodeling

CASE #16



CASE #17





Post-Reduction

CASE #18

ANTERIOR SHOULDER DISLOCATIONS: SPECIAL CONSIDERATIONS

Bankart Lesion

- Detachment of anterior inferior labrum from glenoid rim

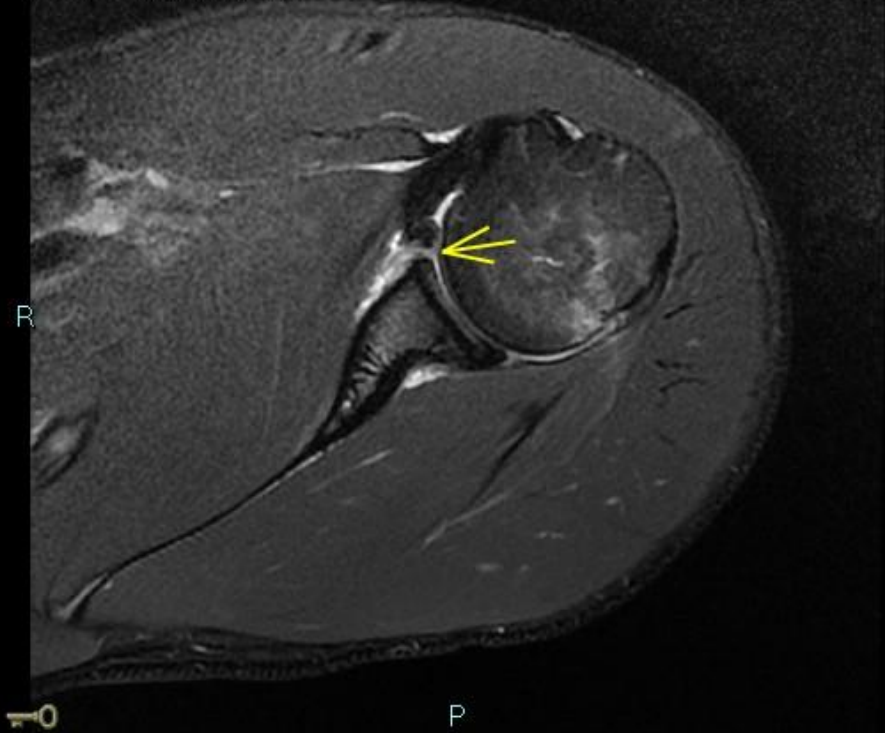
Hills Sachs Defect

- Cortical depression of the posterolateral humeral head when humeral head is impacted by anterior rim of glenoid

Axillary Nerve

- Decreased sensation lateral aspect of shoulder (mid deltoid) and decreased deltoid function

< 20008 - 1 (Principale) >



CASES #19 AND #20

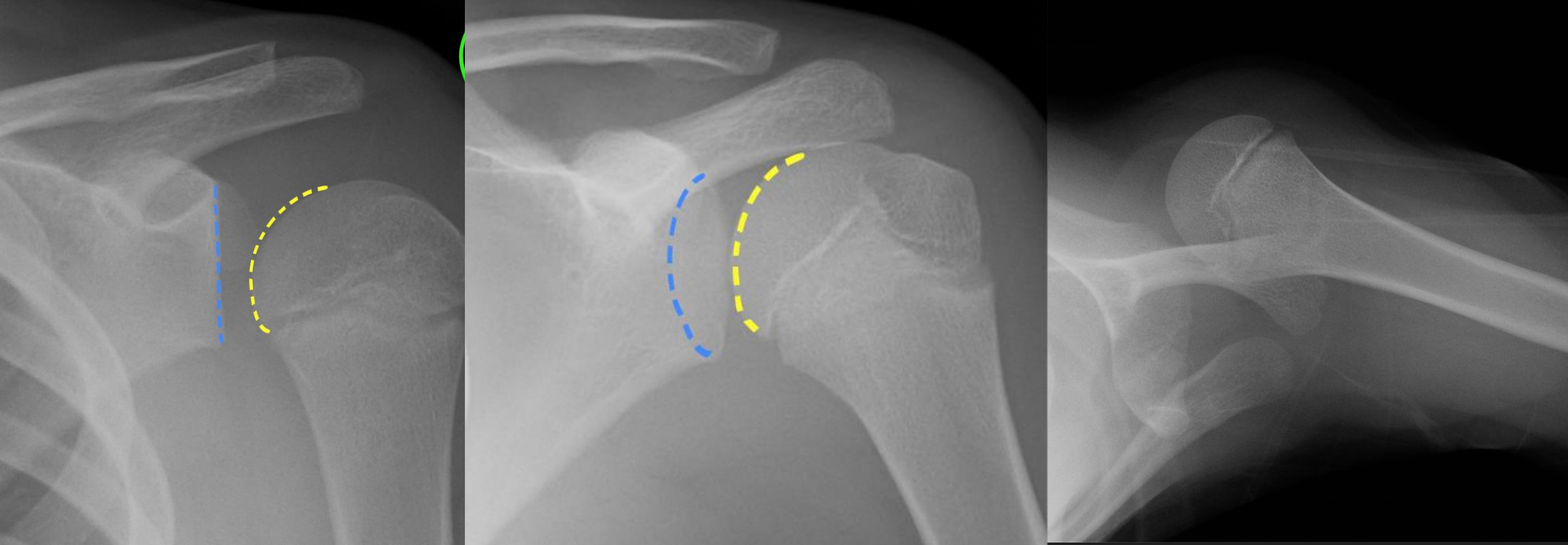
Case courtesy of Dr Maulik S Patel, Radiopaedia.org, rID: 10089

Case courtesy of Dr Domenico Nicoletti, Radiopaedia.org, rID: 60008



CASE #21

Case courtesy of Dr Benoudina Samir, Radiopaedia.org, rID: 58016



CASE #22



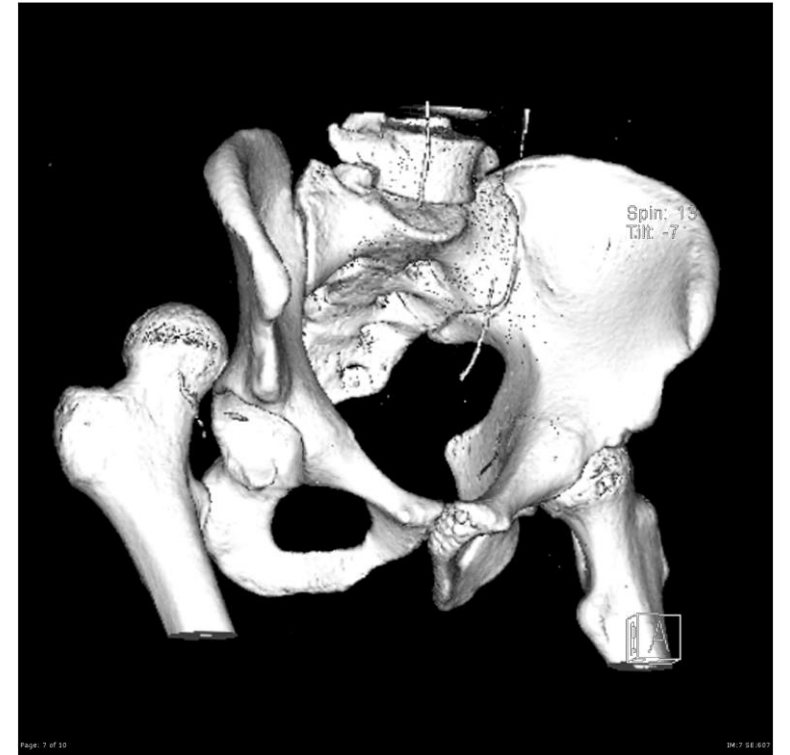
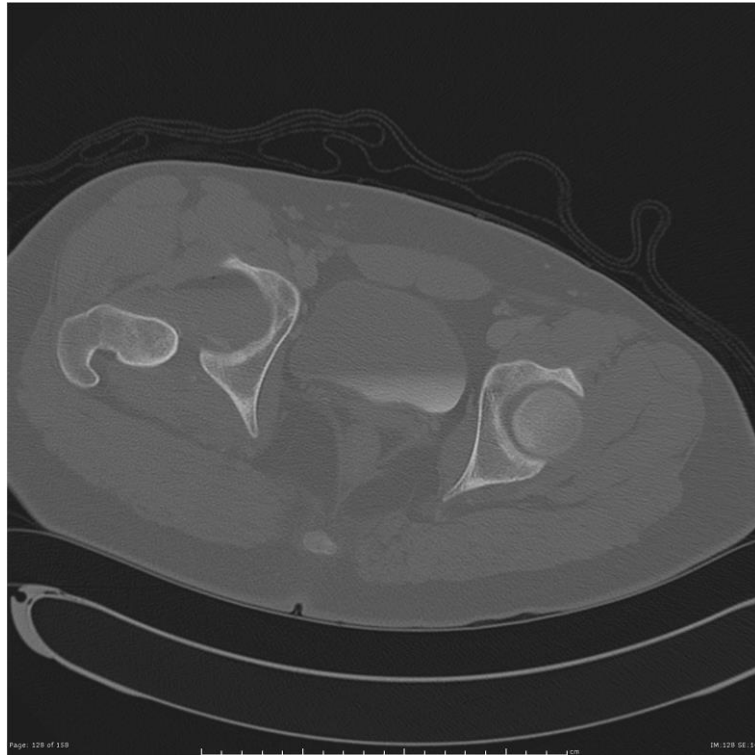
CASE #23

Case courtesy of Dr Henry Knipe, Radiopaedia.org, rID: 27791



CT: CASE #23

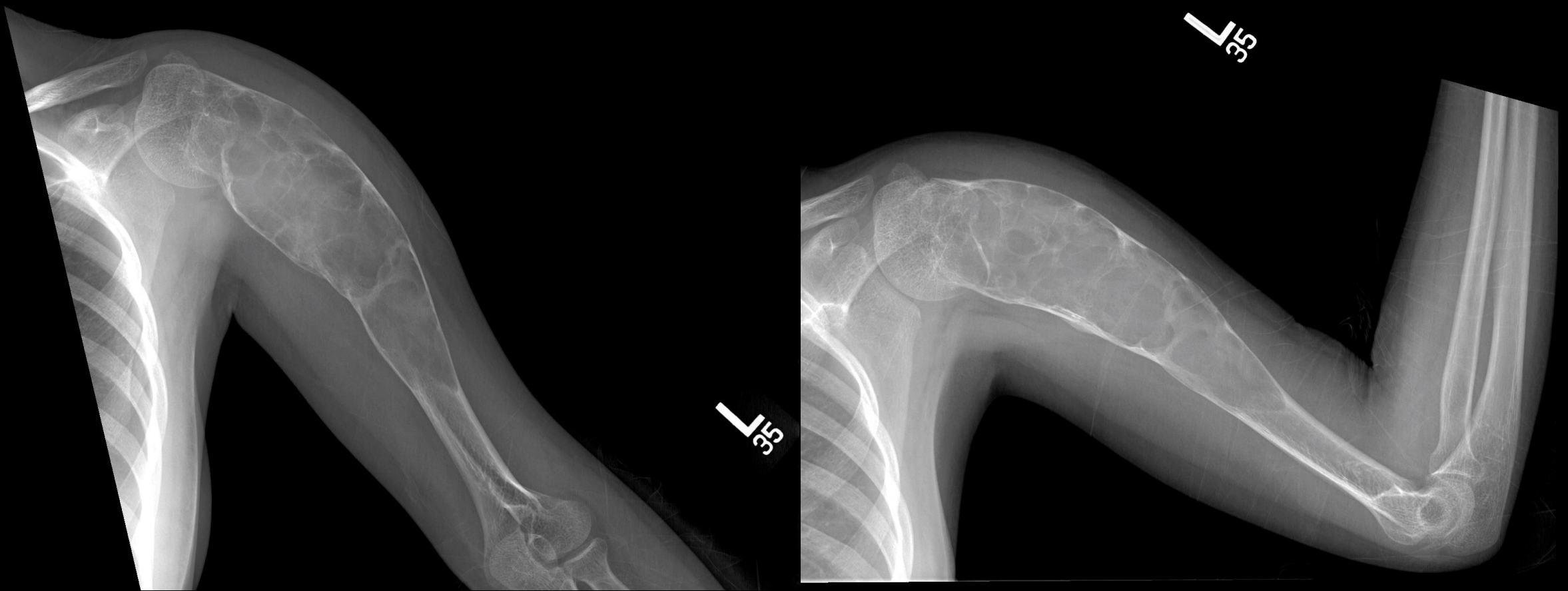
CASE #24



CASES WITH CONCERNING FEATURES ON IMAGING



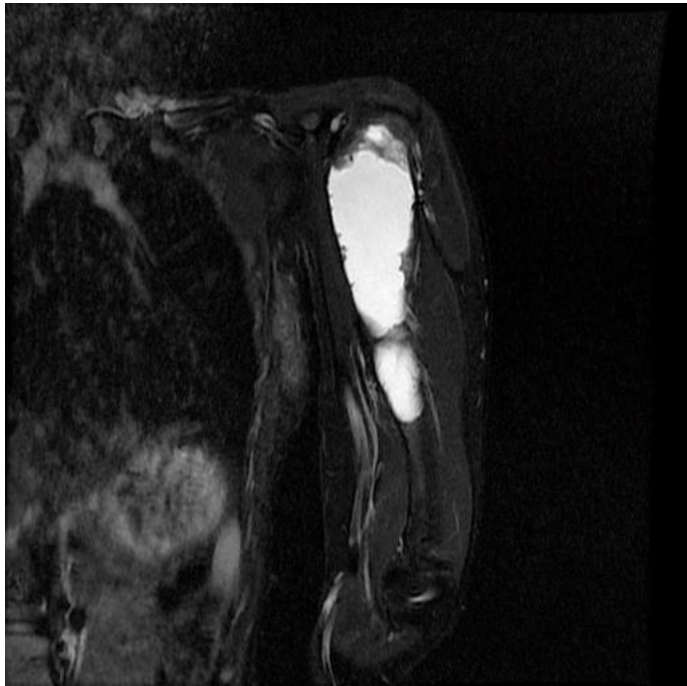
Images courtesy of Henk Jan van der Woude and Robin Smithuis and Radiology Assistant



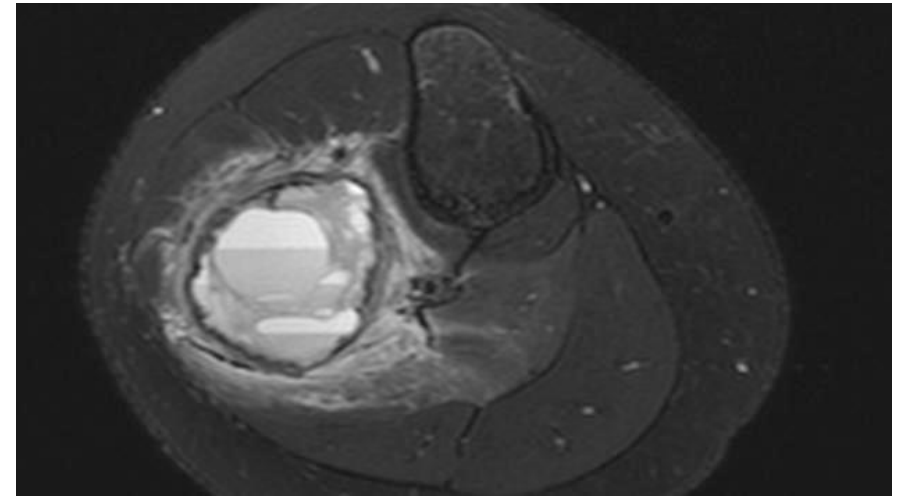
CASE #25

CASE #25 WITH ABC COMPARISON

(FYI FLUID-FLUID LEVEL MAY ALSO BE PRESENT IN A UBC FOLLOWING A PATHOLOGIC FRACTURE)



ABC



Case courtesy of Dr Yasser Asiri, Radiopaedia.org, rID: 65130

Case courtesy of Dr Alexandra Stanislavsky, Radiopaedia.org, rID: 14333

IMAGING

**Radiographic Imaging: first-line
for all tumors**

**MRI: preferred with aggressive
features on radiographs**

**CT: sensitive for cortical
destruction and mineralization**

**Bone Scan (Technetium Tc 99m):
Sensitive for new bone formation**

MRI: T1 VS T2

T1: Better for anatomic assessment

- Fat is bright and typically fluid is dark (gadolinium is bright)

T2: Better for fluid assessment

- Fat/fluid are both bright

Adding “fat saturation” allows for fat to be dark

- Highlights soft tissue injuries

BONE TUMORS AND LESIONS

Concerning Features:

Rapid growth

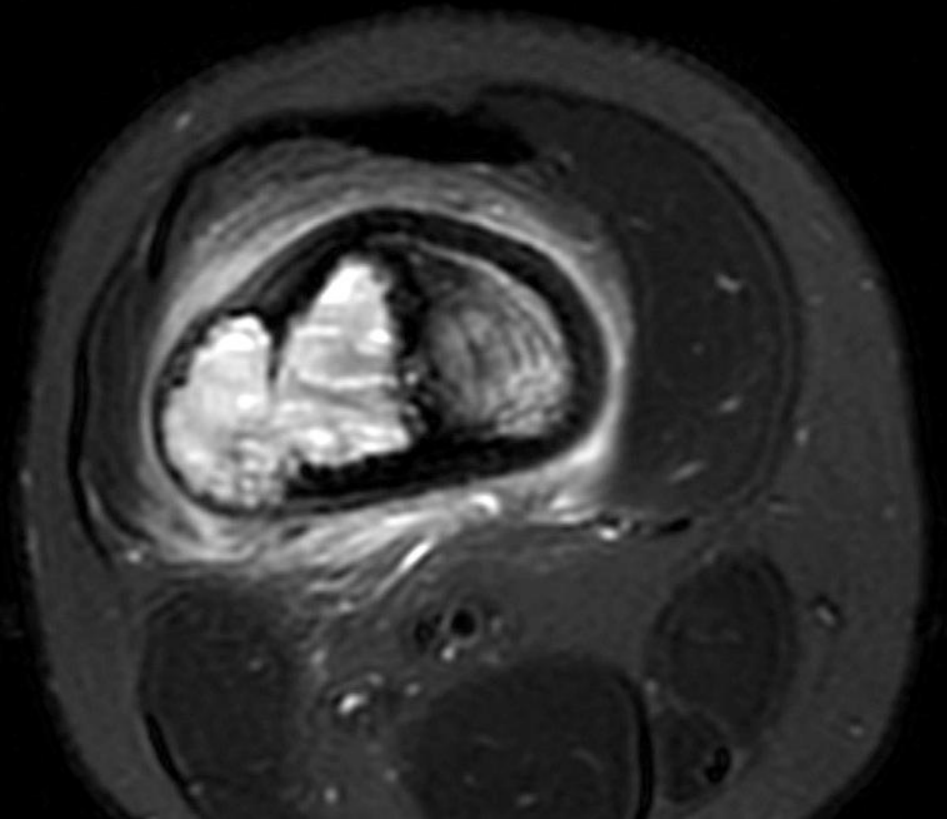
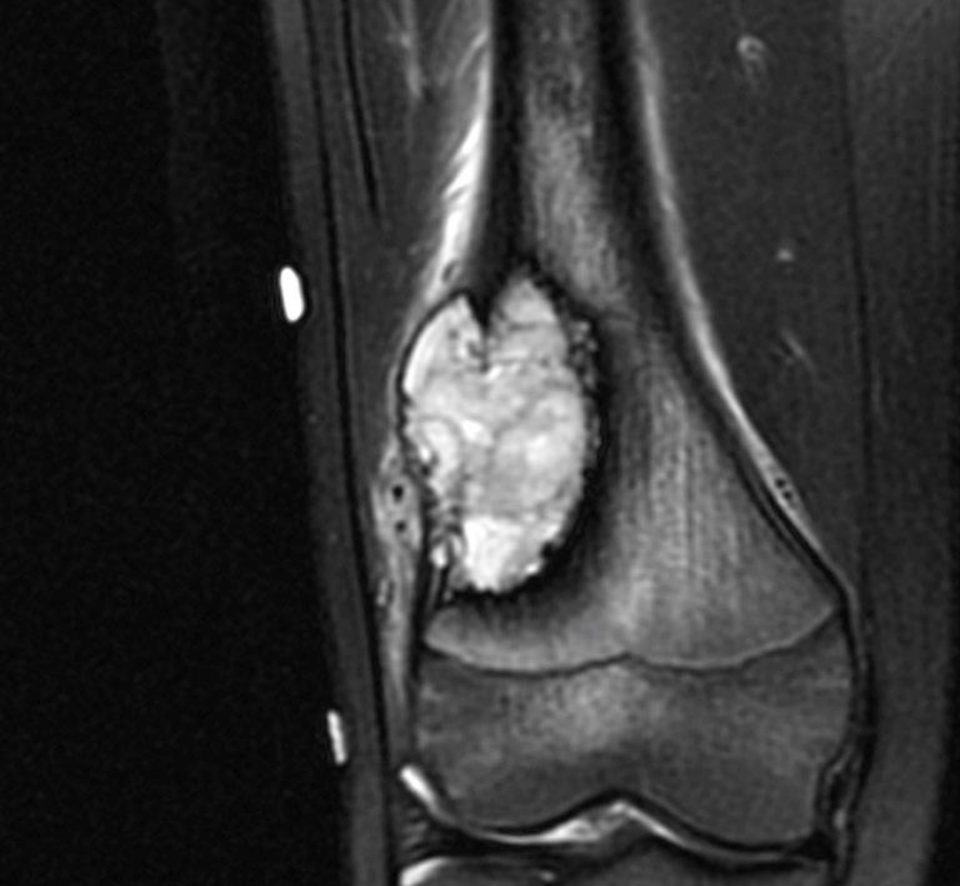
Indistinct margins

Soft tissue mass/invasion

Abnormal periosteal reaction

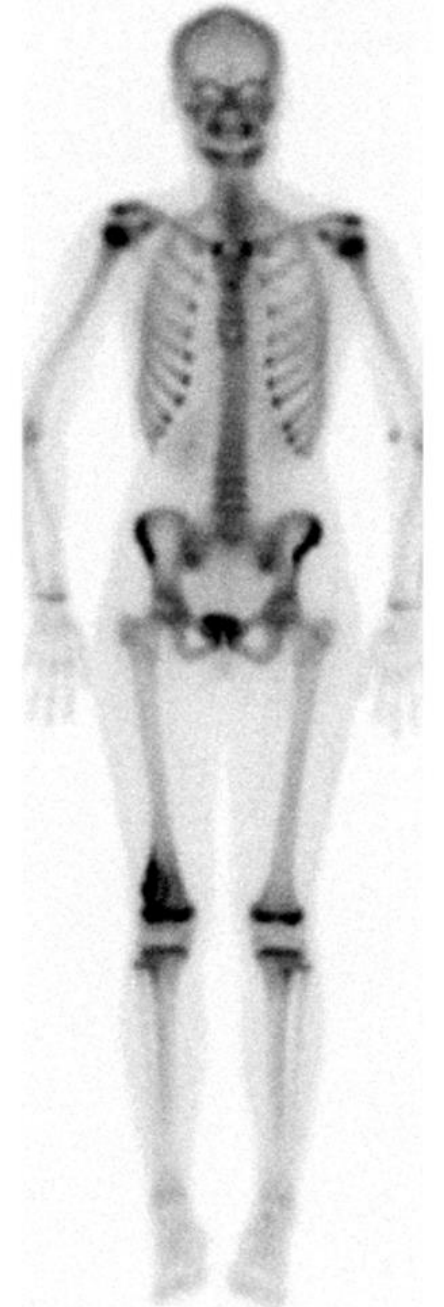


CASE #26



MRI: CASE #26

BONE SCAN: CASE #26



CASE #27



**Most Common: Bone scintigraphy
(Bone Scan)**

Projection: single view or cross-sectional

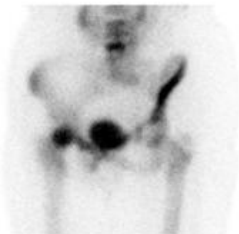


CASE #28

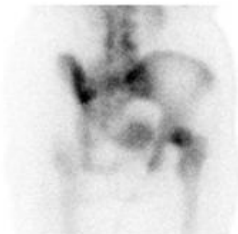
WHOLE BODY BONE SCAN



RT ANTERIOR LT LT POSTERIOR RT RT ANTERIOR LT LT POSTERIOR RT



LAO



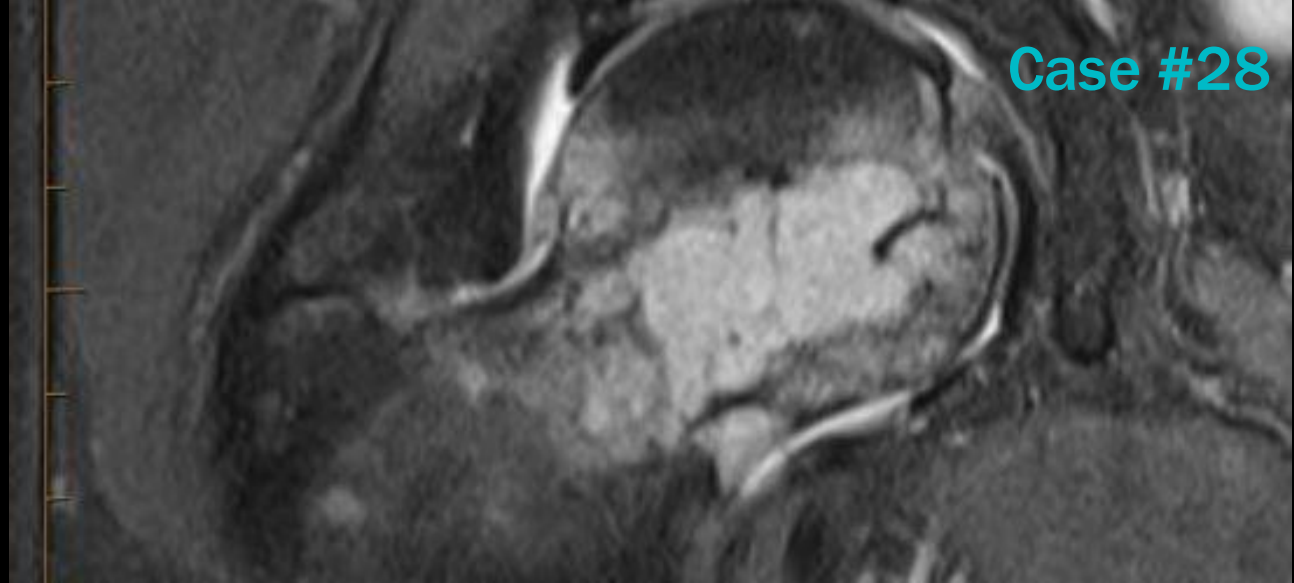
RPO



RAO



LPO



Case #28

MRI AND BONE SCAN: CASE #28

BORDER

WELL-DEFINED, NARROW
ZONE OF TRANSITION



Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 7473

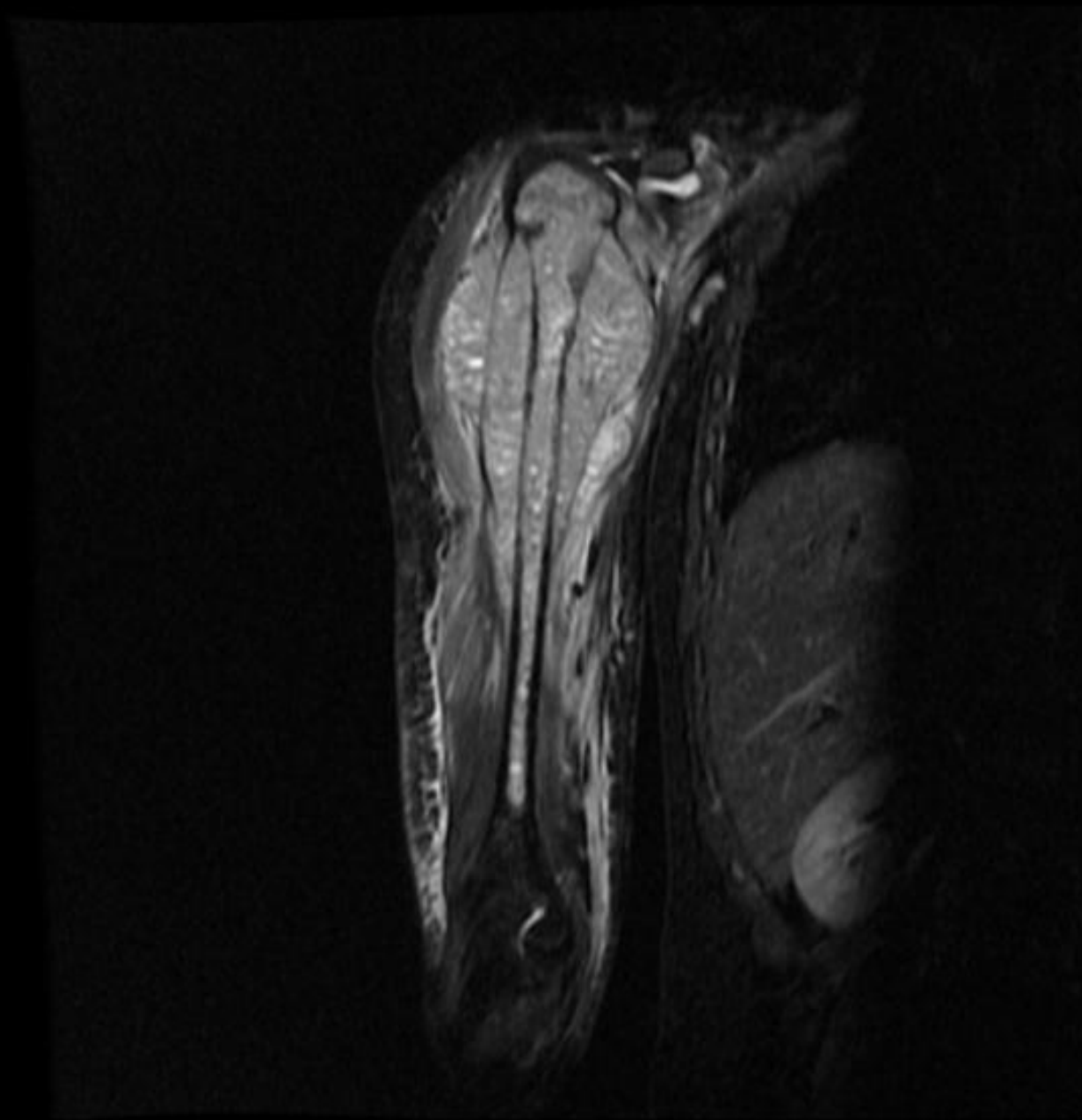
ILL-DEFINED, WIDE ZONE OF
TRANSITION



Case courtesy of Dr Hani Salam, Radiopaedia.org, rID: 7874



CASE #29



BONE DESTRUCTION

CONFINED: GEOGRAPHIC

INFILTRATIVE: MOTH-EATEN/PERMEATIVE



Case courtesy of Dr Roberto Schubert, Radiopaedia.org, rID: 14173

Case courtesy of Dr Hani Salam. Radiopaedia.org. rID: 8002

Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 14003

CASE #30

R

R

MRI: CASE #30



Characteristics of Lesions	Benign or Nonaggressive/Early Malignant	Malignant or Aggressive Benign
Border	Well-defined, Sclerotic margin Narrow zone of transition	Ill-defined Wide zone of transition
Growth Rate	Slow	Rapid
Bone Destruction	Confined Geographic	Infiltrative, cortical destruction Moth-eaten, permeative
Periosteal Reaction	Unilaminar Solid	Multilaminar Interrupted
Soft Tissue Involvement	Absent	Present

REFERENCES

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2. Espinosa JA, Nolan TW. Reducing errors made by emergency physicians in interpreting radiographs: longitudinal study. *BMJ*. 2000;320(7237):737-740.
3. Eng J, Mysko WK, Weller GE, et al. Interpretation of emergency department radiographs a comparison of emergency medicine physicians with radiologists, residents with faculty, and film with digital display. *AJR AM J Roentgenol*. 2000;175:1233-1238.
4. Bolander, S. A systematic approach to describing fractures. *JAAPA*. 2019;32(5):23-29.
5. Nguyen JC, Markhardy BK, Merrow AC, Dwek JR. Imaging of pediatric growth plate disturbances. *Radiographics*. 2017;37(6):1791-1812.

RESOURCES

PAOS: <https://paos.org/>

AAOS: <http://www.aaos.org/>

POSNA: <https://posna.org/>

AAFP: <http://www.aafp.org/>

Radiopaedia: <http://radiopaedia.org/>

OrthoBullets: <https://www.orthobullets.com>

Radiology Assistant: <https://radiologyassistant.nl/>

Books:

Essentials of Musculoskeletal Imaging

- Johnson TR, Steinback LS

Basics of Musculoskeletal Imaging

- Tehranzadeh J

Handbook of Fractures

- Egol KA, Koval KJ, Zuckerman JD

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