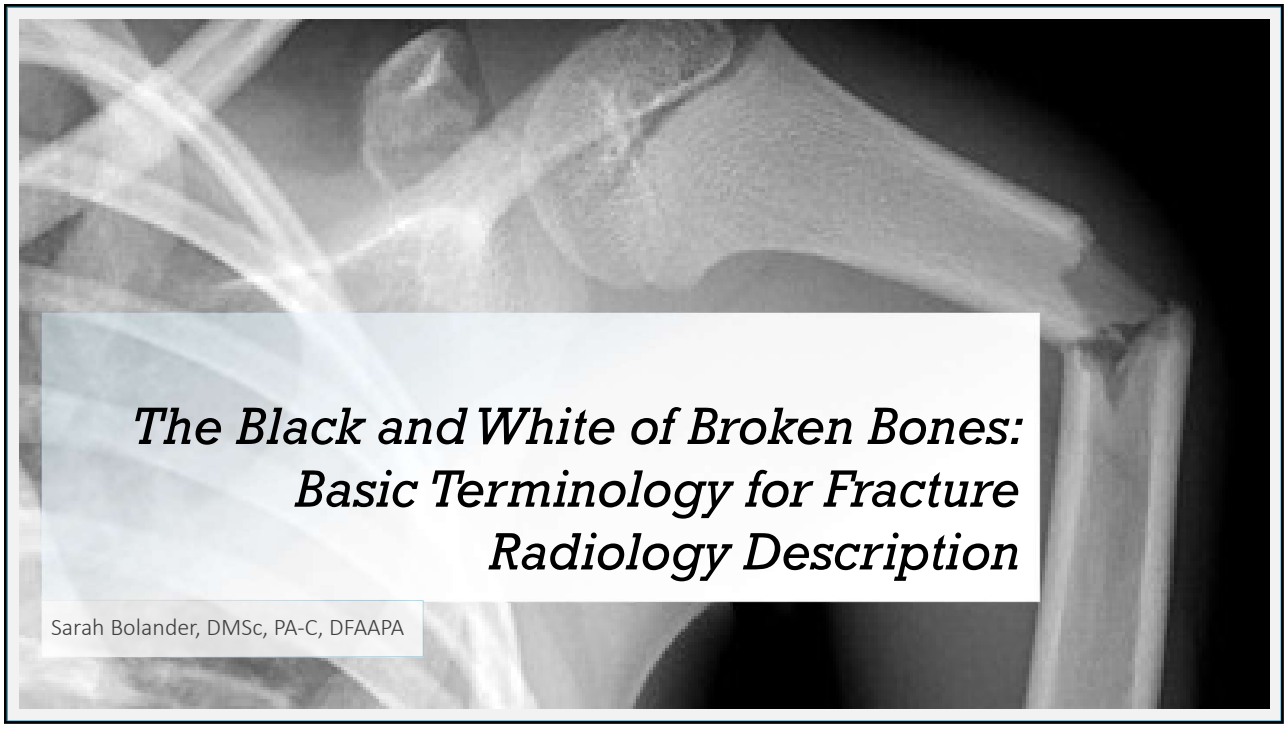

The Black and White of Broken Bones: Basic Terminology for Fracture Radiology Description
Sarah Bolander, DMSc, PA-C, DFAAPA

1

Disclosures

None

2

Objectives

1. Recognize common radiographic findings associated with orthopedic injuries of the extremities.
2. Define terms used to describe the type and pattern of a fractures including transverse, oblique, spiral, greenstick, bowing, torus, etc.
3. Describe a fracture in terms of site, location, configuration, articular involvement and potential for physeal extension .
4. Determine amount of fracture displacement including translation and angulation.
5. Identify and describe worrisome features of bone tumors or lesions to help differentiate potential causes.

3

X-ray Viewing

Patient Information

- Who
  - Correct patient
- What
  - Correct location
  - Correct views
- Orientation
- Quality of film

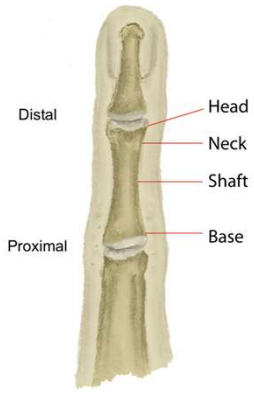
ONE VIEW IS NO VIEW

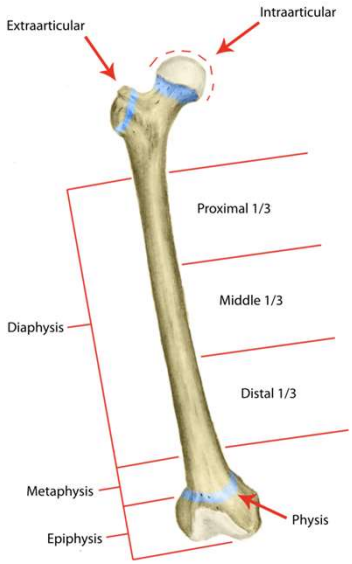
Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 7482

4

Location

Which bone? Where in the bone? Joint involvement?





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Articular Extension

Case courtesy of Dr Aditya Shetty, Radiopaedia.org, rID: 28755

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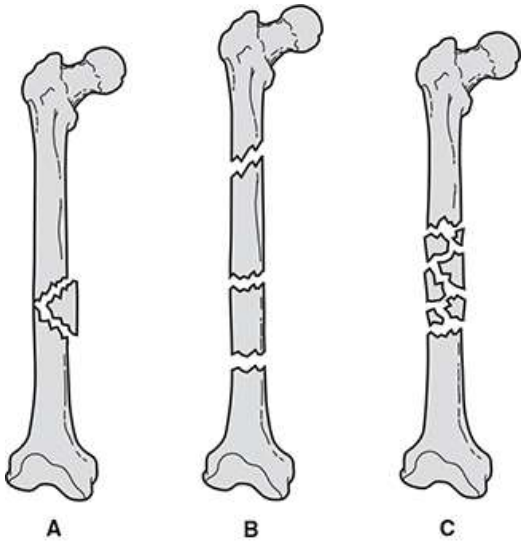
Case courtesy of eduardo bravo, Radiopaedia.org, rID: 55586

7

Type Severity

Complete vs Incomplete?

Complete: Simple vs Comminuted?



Source: Lynn N. McKinnis: *Fundamentals of Musculoskeletal Imaging*, 4th Edition:
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Type Severity

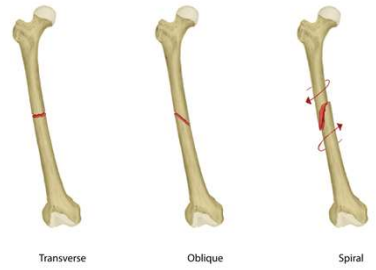
8

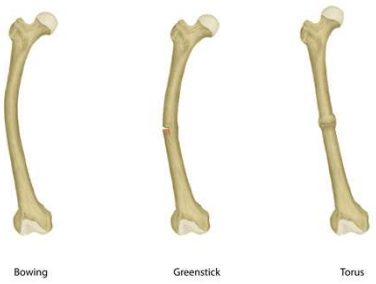
Pattern

Complete: transverse, oblique, spiral

Incomplete: greenstick, torus, bowing

Unique pattern considerations: compression, impaction, avulsion, stress





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Fracture Patterns

Incomplete:
Bowing
Greenstick
Torus

Common Pediatric Fracture Types

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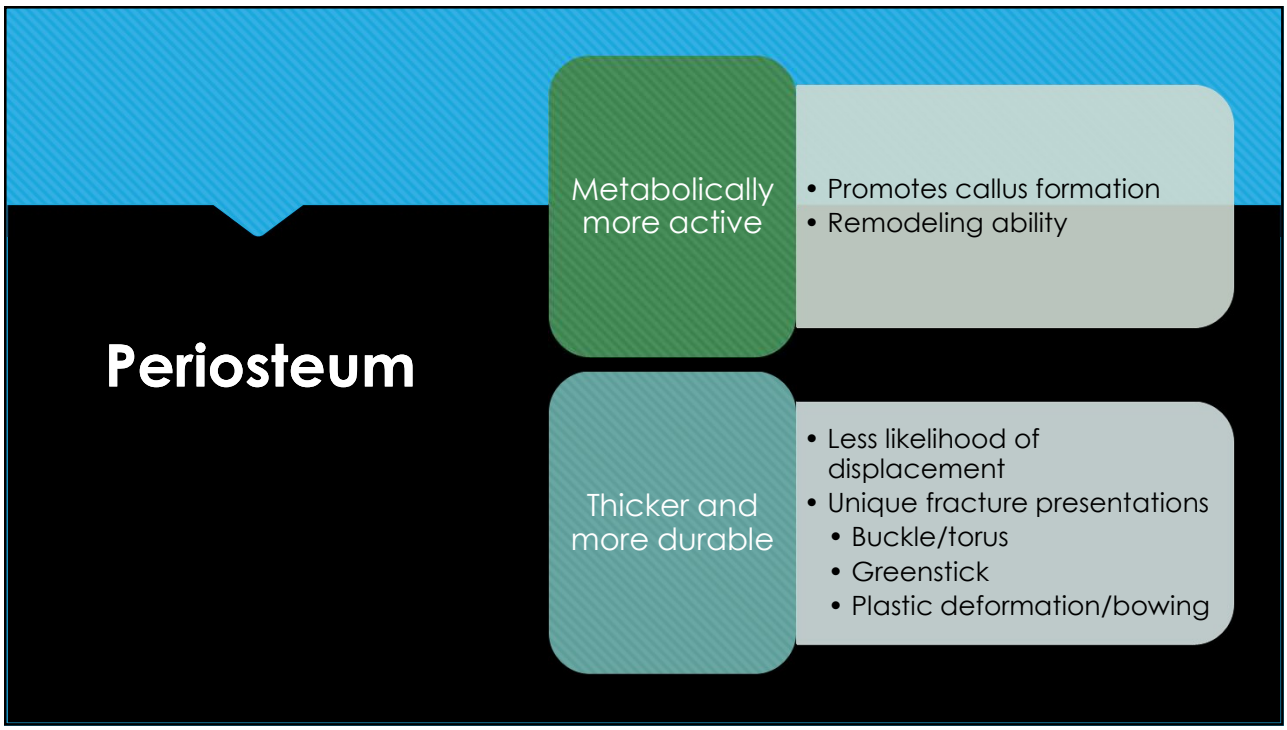
Periosteum
Metabolically more active
• Promotes callus formation
• Remodeling ability
Thicker and more durable
• Less likelihood of displacement
• Unique fracture presentations
• Buckle/torus
• Greenstick
• Plastic deformation/bowing

11


L
S-03
L
IS-03
Case courtesy of Dr Hani Salam, Radiopaedia.org, rID: 9611

12


L
88
Case courtesy of Dr Hani Salam, Radiopaedia.org, rID: 13297

13


L
L
*
Case courtesy of Dr Jeremy Jones, Radiopaedia.org, rID: 44173

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Fracture Patterns

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Complete:

Transverse

Oblique

Spiral

15

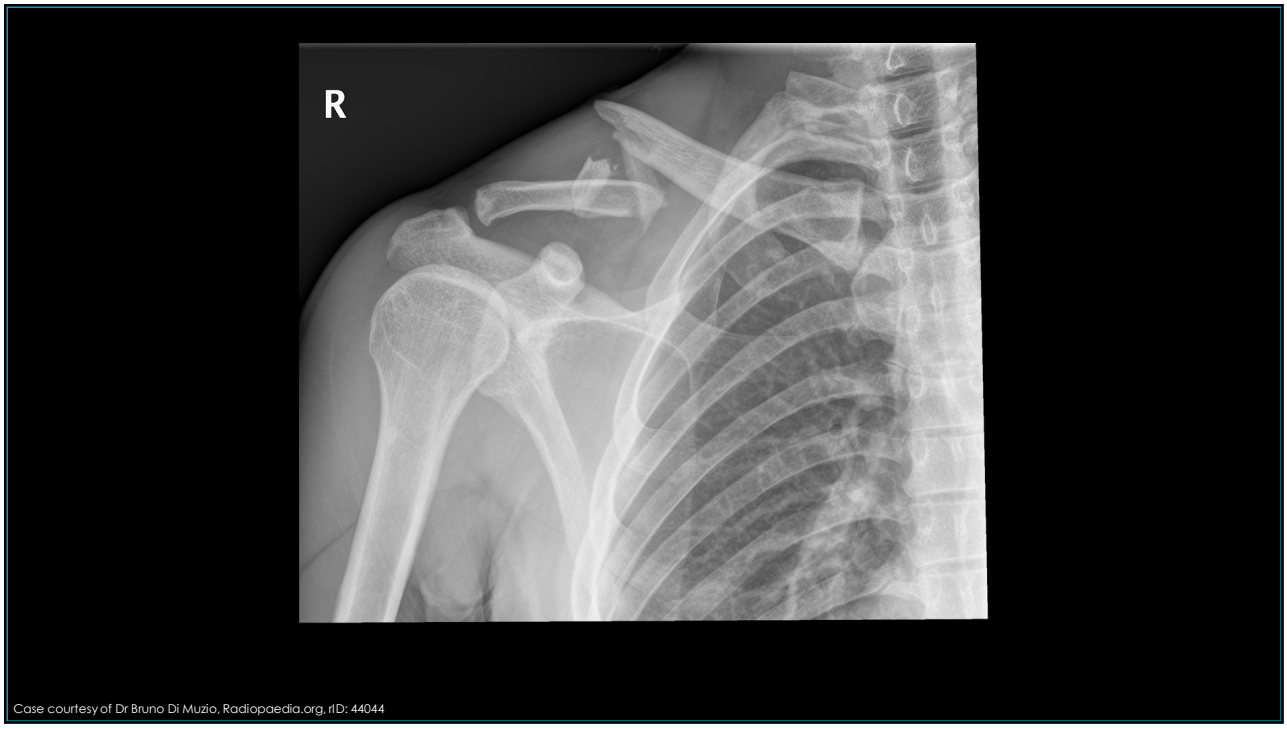
16


L
L
Case courtesy of Dr Piotr Gotofit, Radiopaedia.org, rID: 48267

17


L
Horizontal Beam
L
Case courtesy of Dr Andrew Dixon, Radiopaedia.org, rID: 25704

18


R
Case courtesy of Dr Bruno Di Muzio, Radiopaedia.org, rID: 44044

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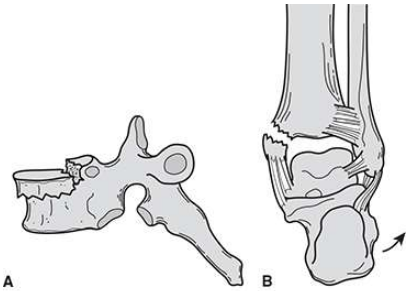
Unique pattern considerations:

- Compression
- Impaction
- Avulsion
- Fissure
- Stress



Source: Lynn N. McKinnis: *Fundamentals of Musculoskeletal Imaging*, 4th Edition: www.FADavisPTCollection.com

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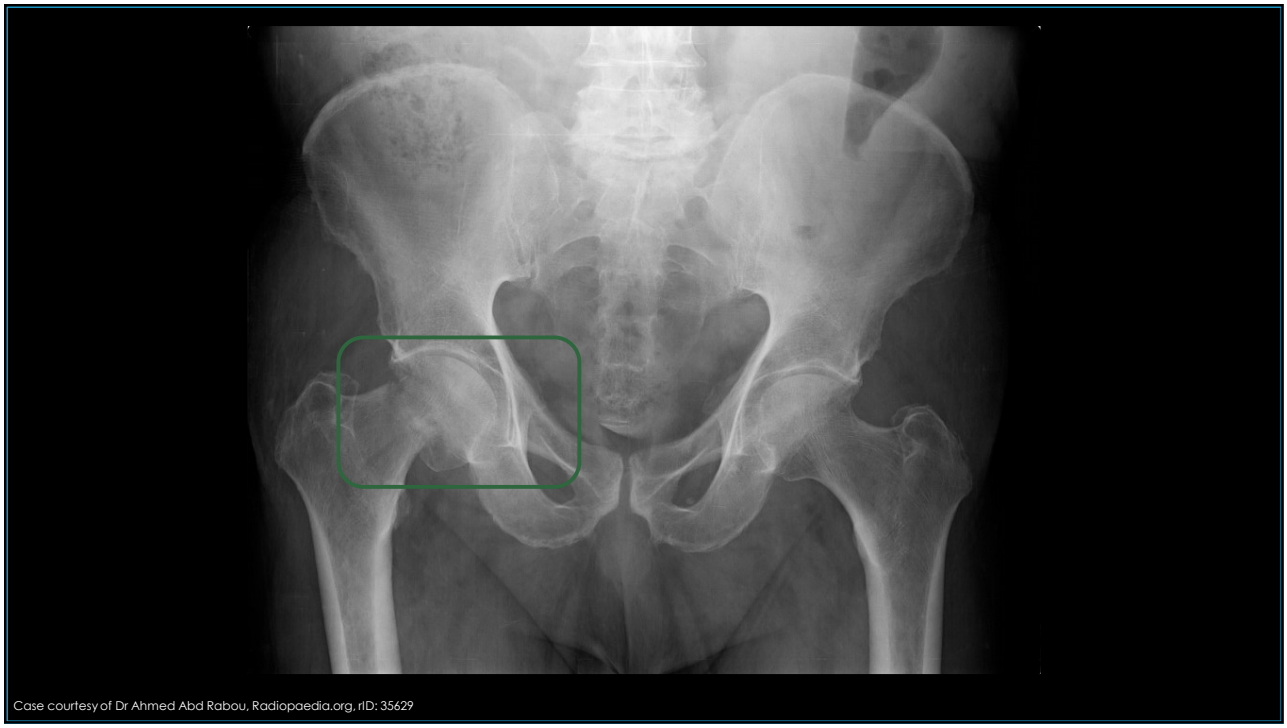
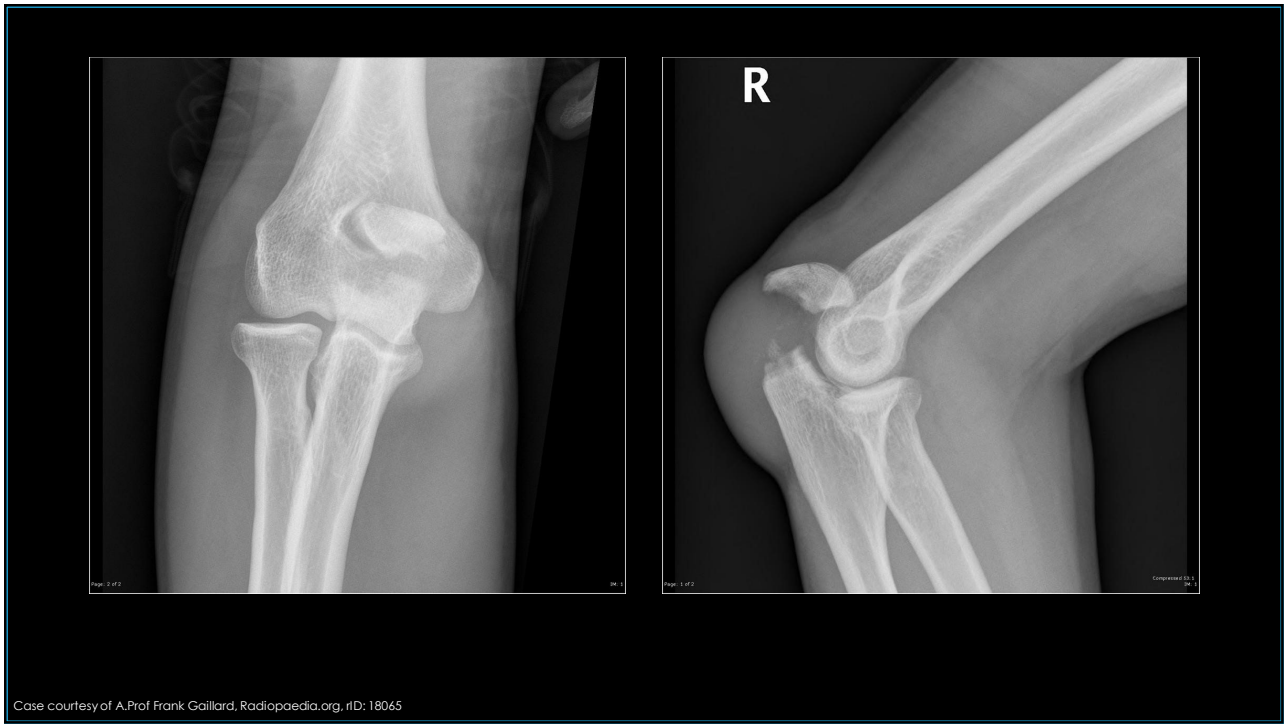

Case courtesy of Dr Ahmed Abd Rabou, Radiopaedia.org, rID: 35629

21


R
Case courtesy of A.Prof Frank Gaillard, Radiopaedia.org, rID: 18065

22

23

Apophyseal Injuries

Bony prominences arising from separate ossification centres

- Fibrocartilage
- Fusion over time
- Site of tendon or ligament attachment
- Prone to overuse injuries

24

Position

Displacement:

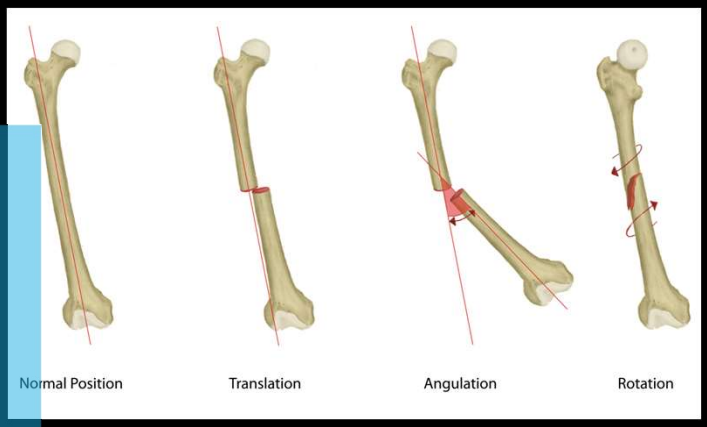
Translation (Apposition),

Angulation,

Rotation,

Shortening,

Distraction



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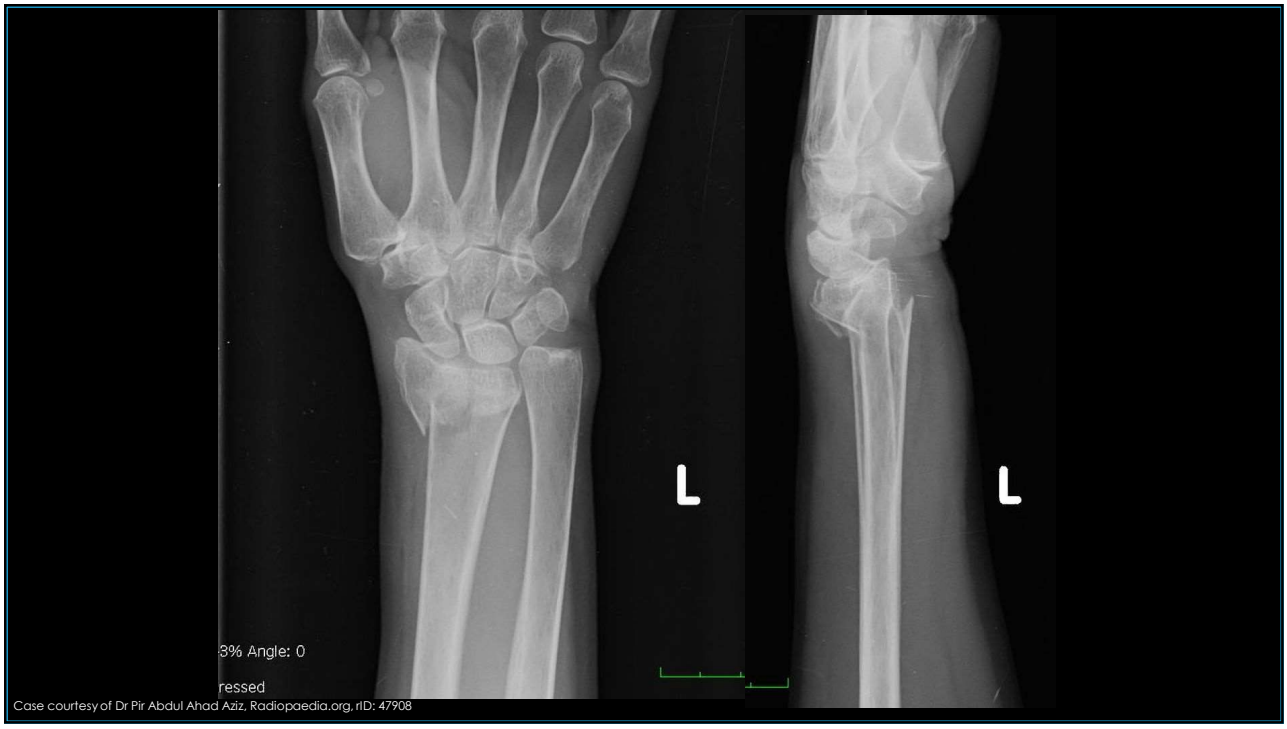
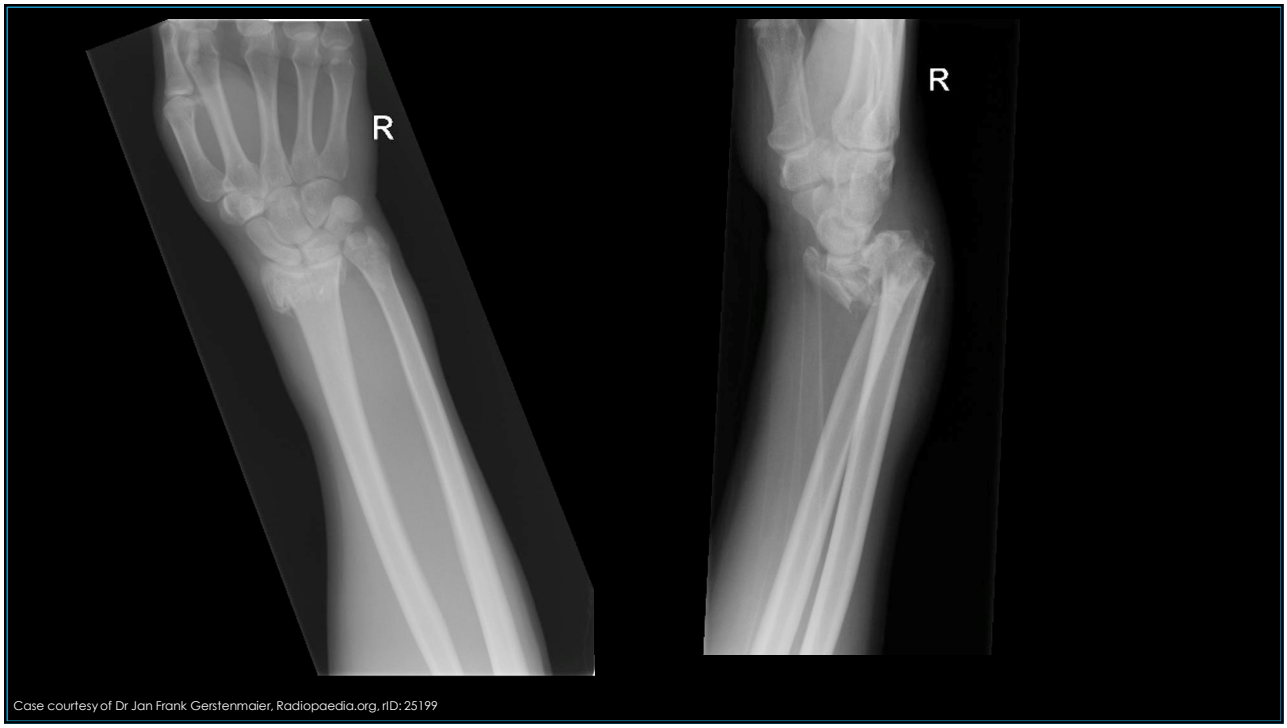
L
L
Case courtesy of Dr Piotr Gotofit, Radiopaedia.org, rID: 48267

26

27


L
L
3% Angle: 0
ressed
Case courtesy of Dr Pir Abdul Ahad Aziz, Radiopaedia.org, rID: 47908

28


R
R
Case courtesy of Dr Jan Frank Gerstenmaier, Radiopaedia.org, rID: 25199

29


Possible Complications
Open Fracture, Physeal Involvement, Pathologic

30

Open vs Closed

If open: lead with this finding!

31

I
Separate
II
Above
III
Lower
IV
Through
V
Reduced

Most common

Salter-Harris Classification

TYPE I	TYPE II	TYPE III	TYPE IV	TYPE V
S	A	L	T	R

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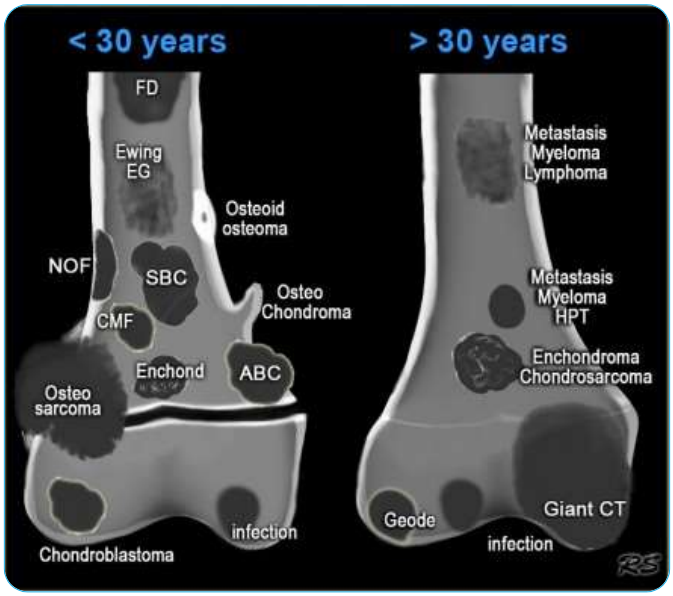
32


E
E
Case courtesy of Dr Bruno Di Muzio, Radiopaedia.org, rID: 38791

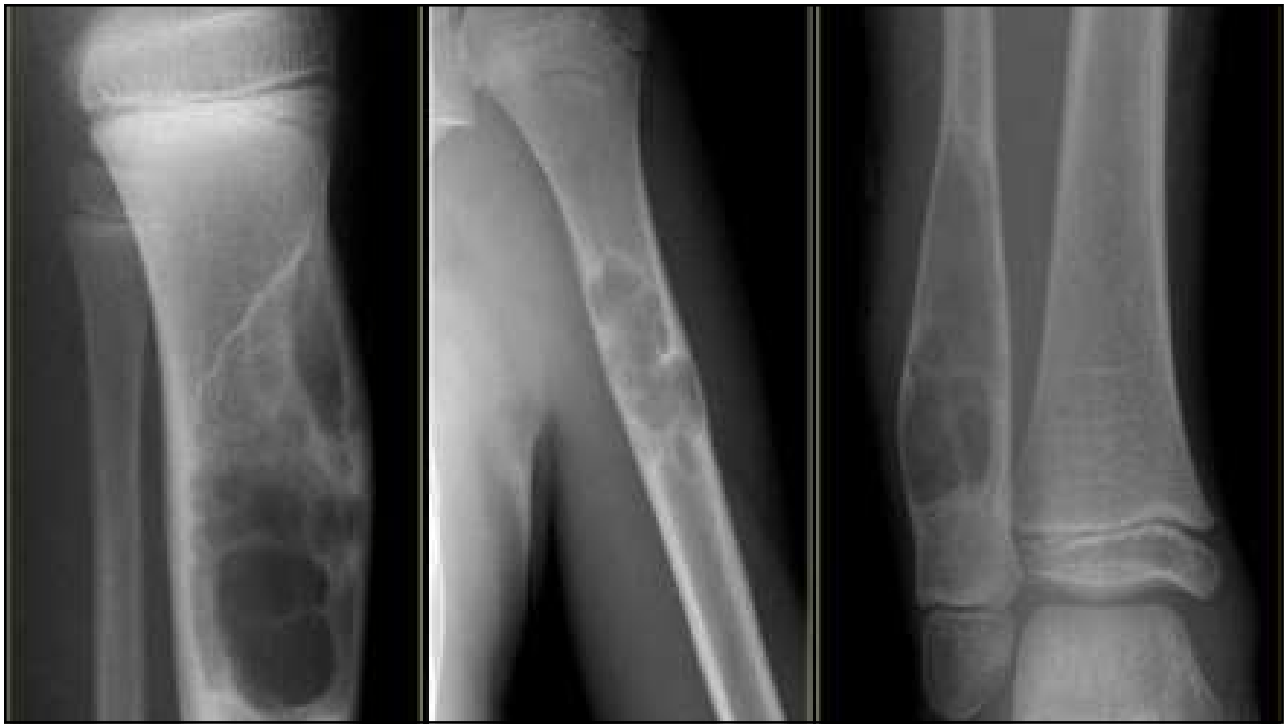
33



Radiology Assistant

Bone Tumors and Lesions causing Pathologic Fractures

34



35

Bone Tumors and Lesions

Concerning Features:

- Indistinct margins
- Abnormal periosteal reaction
- Soft tissue mass/invasion
- Rapid growth

36


Radiology Assistant
Osteosarcoma
Infection
Eosinoph granuloma

37

Anything Else

- Additional injuries
- Artifact
- Occult fracture

38

Additional Injuries

39

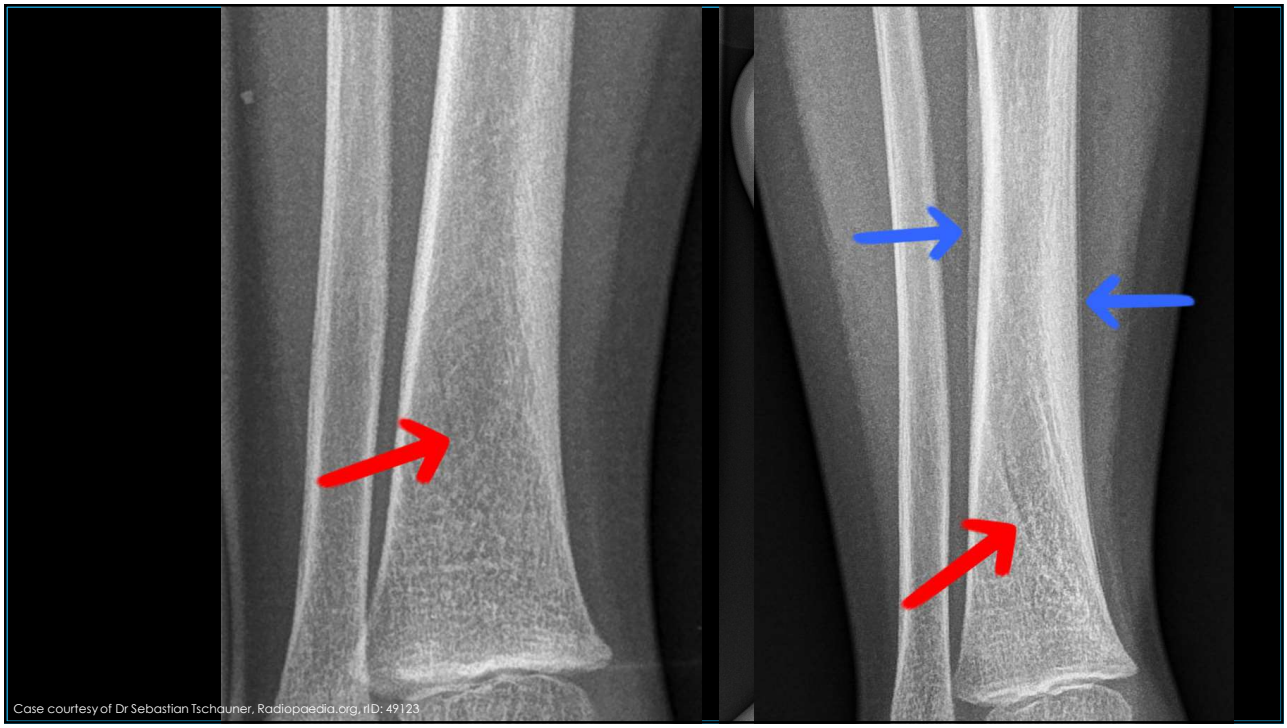
Artifact

Case courtesy of Dr Aditya Shetty, Radiopaedia.org, rID: 27308

40

Occult Fracture

41


Case courtesy of Dr Sebastian Tschauner, Radiopaedia.org, rID: 49123

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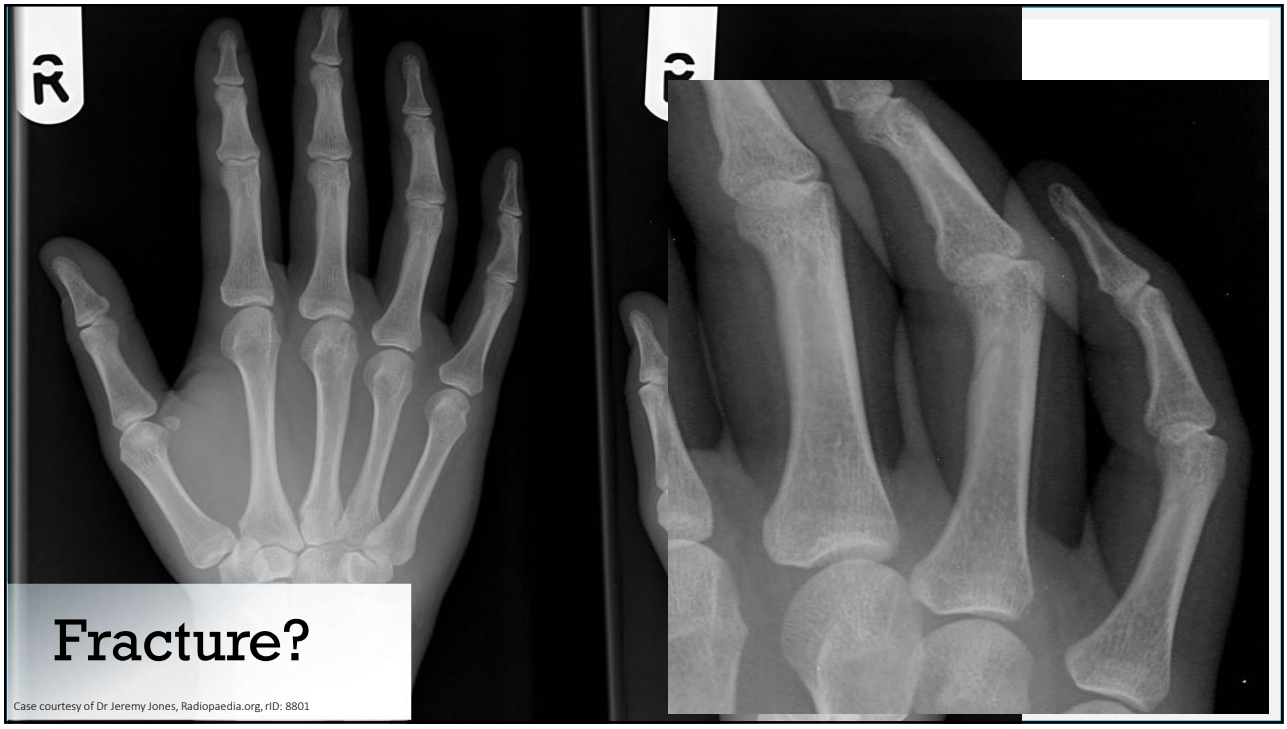
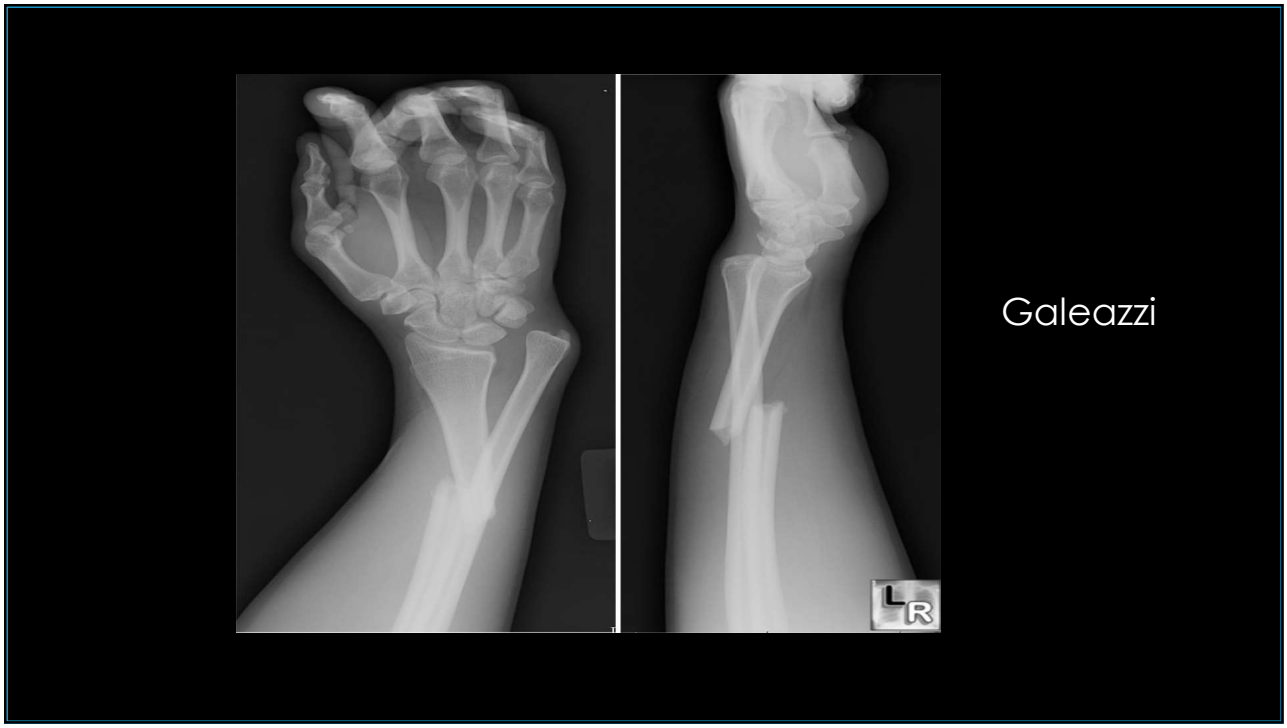

R
Fracture?
Case courtesy of Dr Jeremy Jones, Radiopaedia.org, rID: 8801

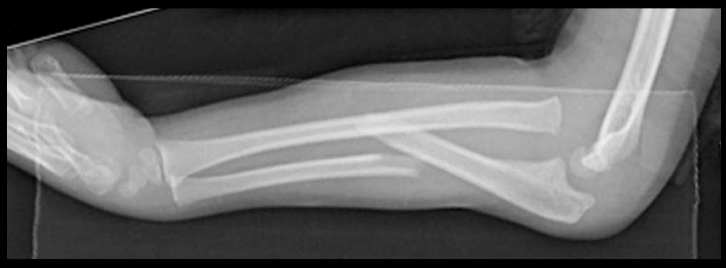
43

44



45

Monteggia



Case courtesy of Radswiki, Radiopaedia.org, rID: 12222

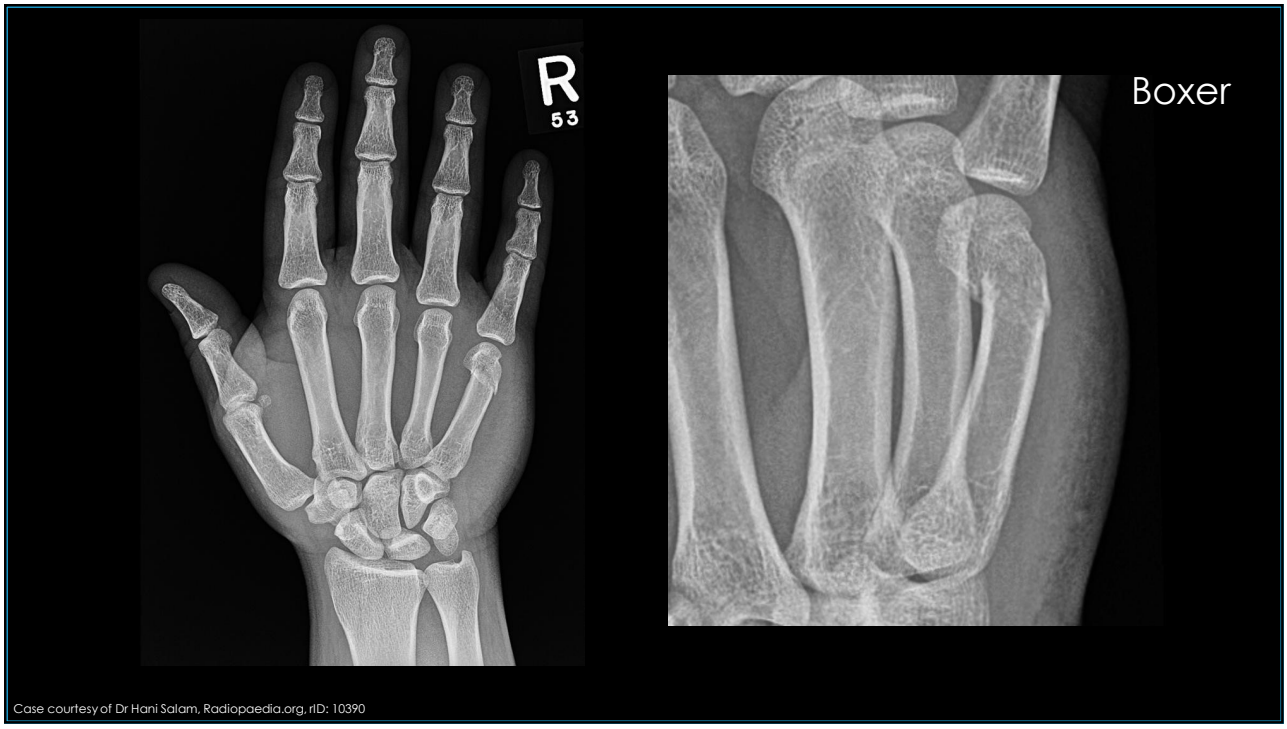
46


Colles
L
Case courtesy of Dr Pir Abdul Ahad Aziz, Radiopaedia.org, rID: 47908

47


R
Smith
(Reverse Colles)
Case courtesy of Dr Jan Frank Gerstenmaier, Radiopaedia.org, rID: 25199

48


R
53
Boxer
Case courtesy of Dr Hani Salam, Radiopaedia.org, rID: 10390

49


Bennett
Case courtesy of eduardo bravo, Radiopaedia.org, rID: 55586

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Practice!

Location and Site:

Type:

Pattern:

Position:

Complications:

Complete Description:

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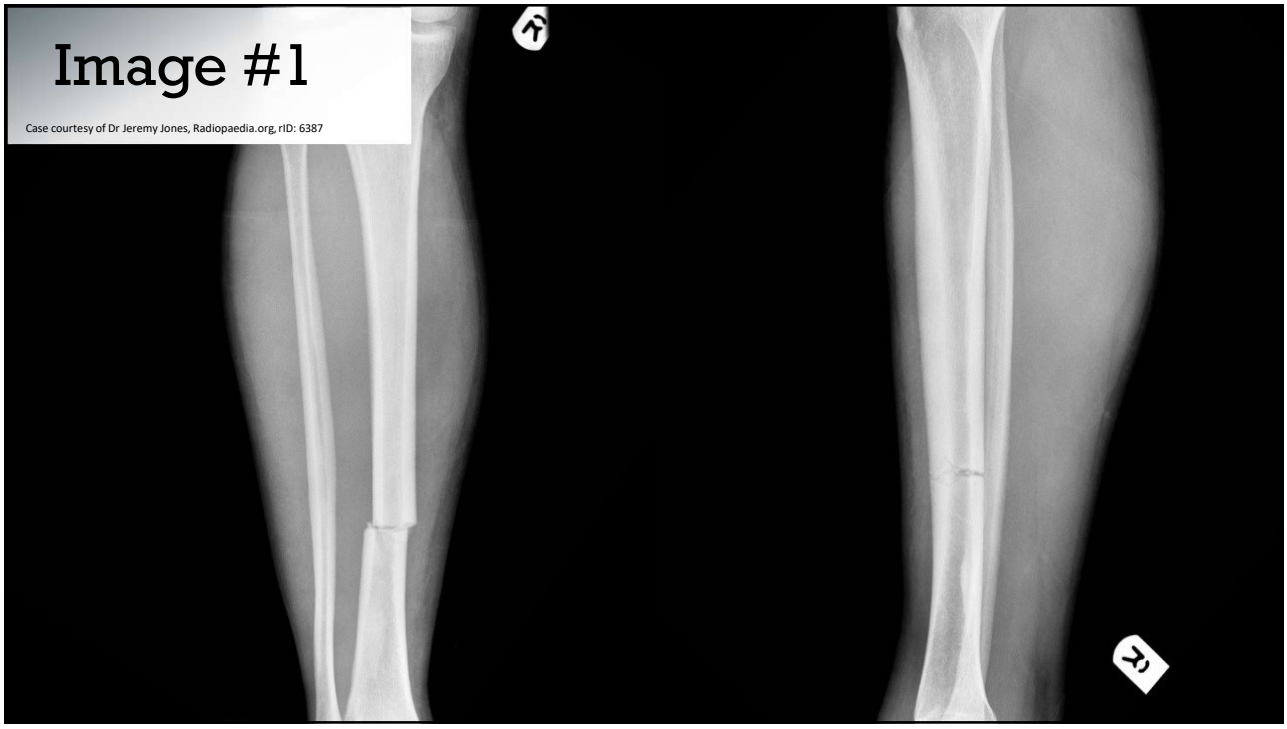
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Image #2
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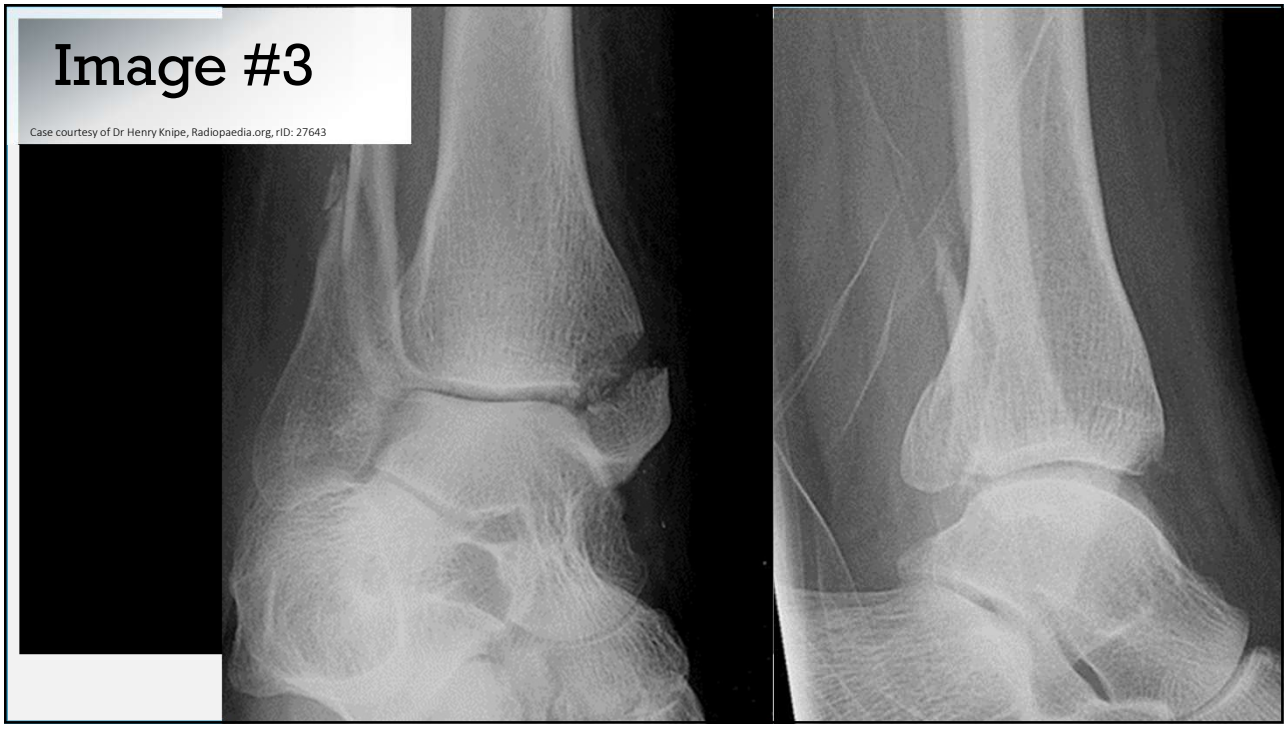
Image #3
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Image #4
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Image #5
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Image #6
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Summary

Be systematic

Verify your patient

Obtain quality films

- Multiple correct views
- Joint visualization

Systematically identity fractures

- Compare to unaffected side if needed

Describe fractures accurately

- Location
- Type/Severity
- Pattern
- Position
- Complications

*Correlate Findings with Clinical Exam

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Resources

- AAOS: http://www.aaos.org/
- POSNA: https://posna.org/
- Radiopaedia: http://radiopaedia.org/
- Radiology Assistant: http://www.radiologyassistant.nl

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Resources for Images and Figures*

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*Hyperlink or case number available for specific references

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