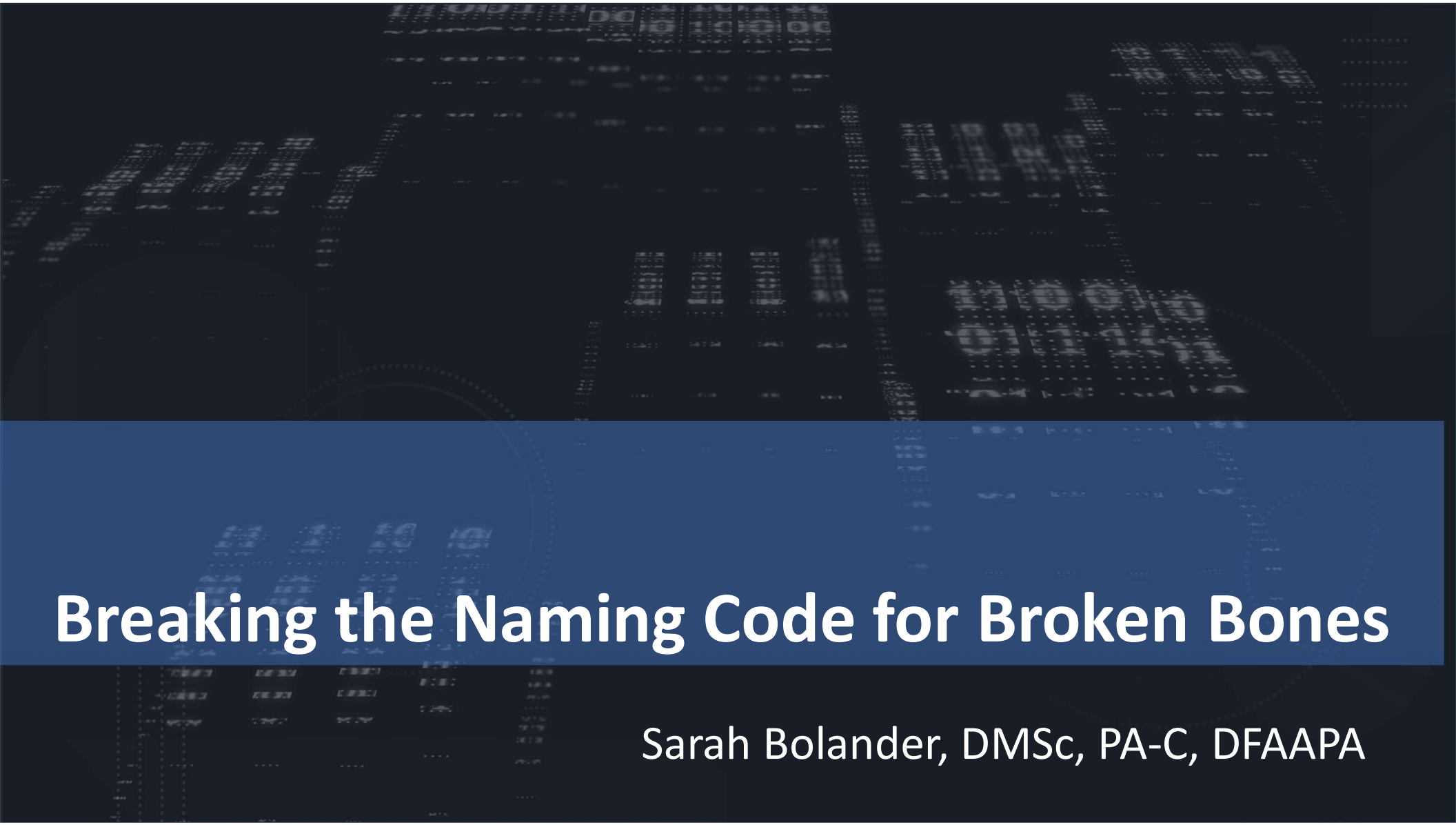


Breaking the Naming Code for Broken Bones

Sarah Bolander, DMSc, PA-C, DFAAPA

Session Objectives

- Differentiate common radiographic findings with orthopedic injuries of the extremities
- Define the specific injury components for common eponyms and other named fractures
- Discuss frequent misuse of eponymous fracture names and the potential impacts to the patient
- Compare alternative fracture terminology for describing complex musculoskeletal injuries

Eponymous Fracture or Fracture-Dislocation

Named fractures for who first described or classified the injury:

- **Benefit:** Provides rapid, succinct description of complex fracture patterns.
- **Disadvantage:** Often mistermed which creates confusion and misdirects management. Does not always account for severity of the injury.

Upper Extremity Eponymous Fractures

Case #1

40 yo

Left shoulder pain following anterior shoulder dislocation

Hx of repeat dislocations

(7 episodes in 6 months)

Hills Sachs Defect

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

Hills Sachs Defect

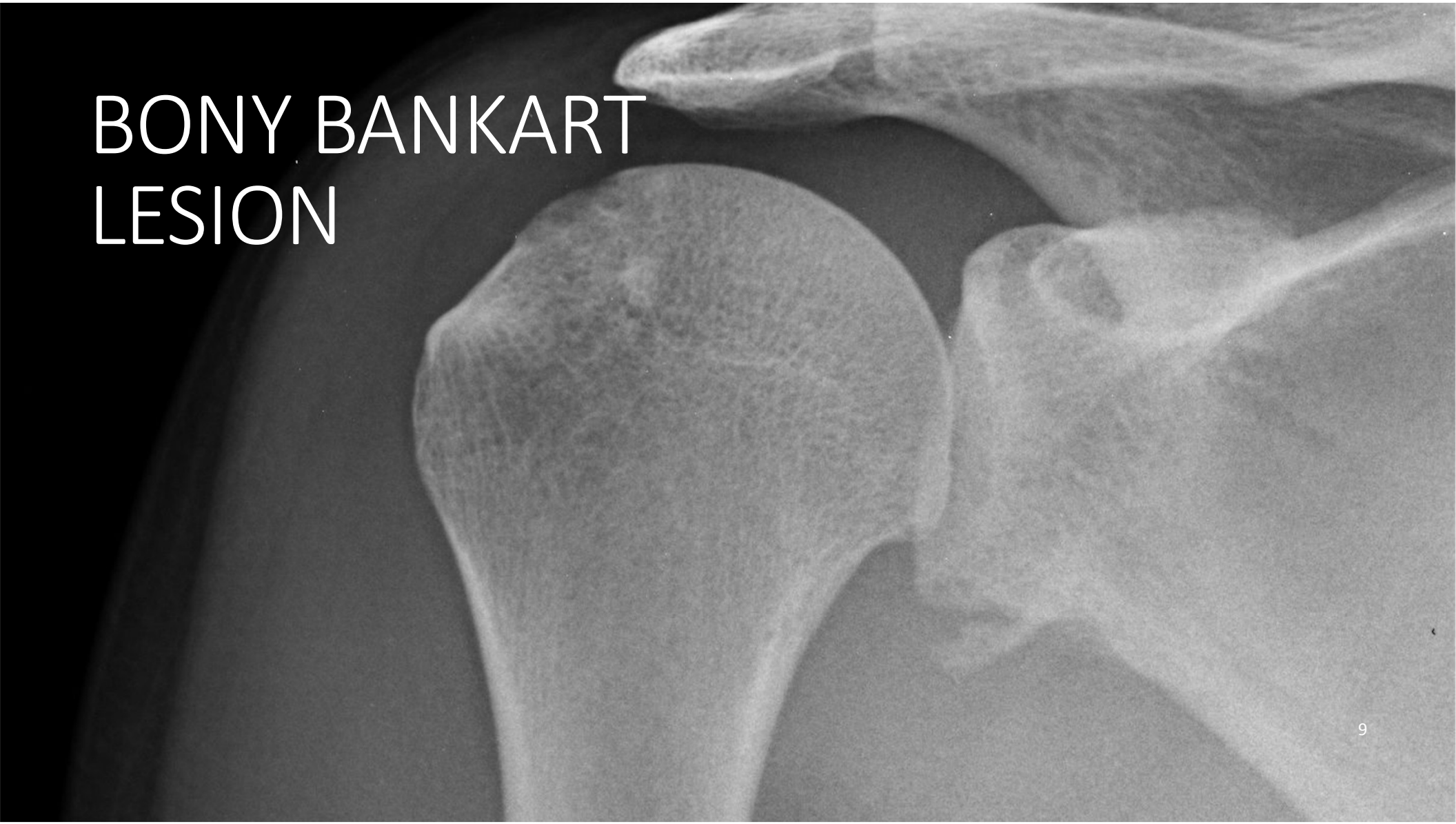
- Radiologists Arthur Hill and David Sachs
- Pattern: compression fracture of the posterolateral humeral head
- MOI: Anterior shoulder dislocations
  - Impaction- anterior glenoid rim

TIP: AP with internal rotation of the shoulder provides best view

Case #2

- 25 yo
- Right shoulder pain following anterior shoulder dislocation
- Hx of recurrent dislocations
- Associated with Hills Sachs lesion

BONY BANKART LESION



Bankart Lesion

- English orthopedic surgeon Arthur Bankart
- Pattern: Soft tissue injury of the anteroinferior glenoid labrum (detachment/tear)
  - Bony Bankart involves a fracture of the anteroinferior glenoid
- MOI: anterior shoulder dislocation
- *Commonly associated with Hills Sachs*

TIP: **MRI preferred** if additional imaging needed

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

CASE #3

Adult

Right distal humeral fracture

Follow-up after 5 weeks

HOLSTEIN-LEWIS FRACTURE

Holstein-Lewis Fracture

- American orthopedic surgeons Arthur Holstein and Gwilym Lewis
- Pattern: Spiral fx of the distal third of the humerus
- MOI: trauma

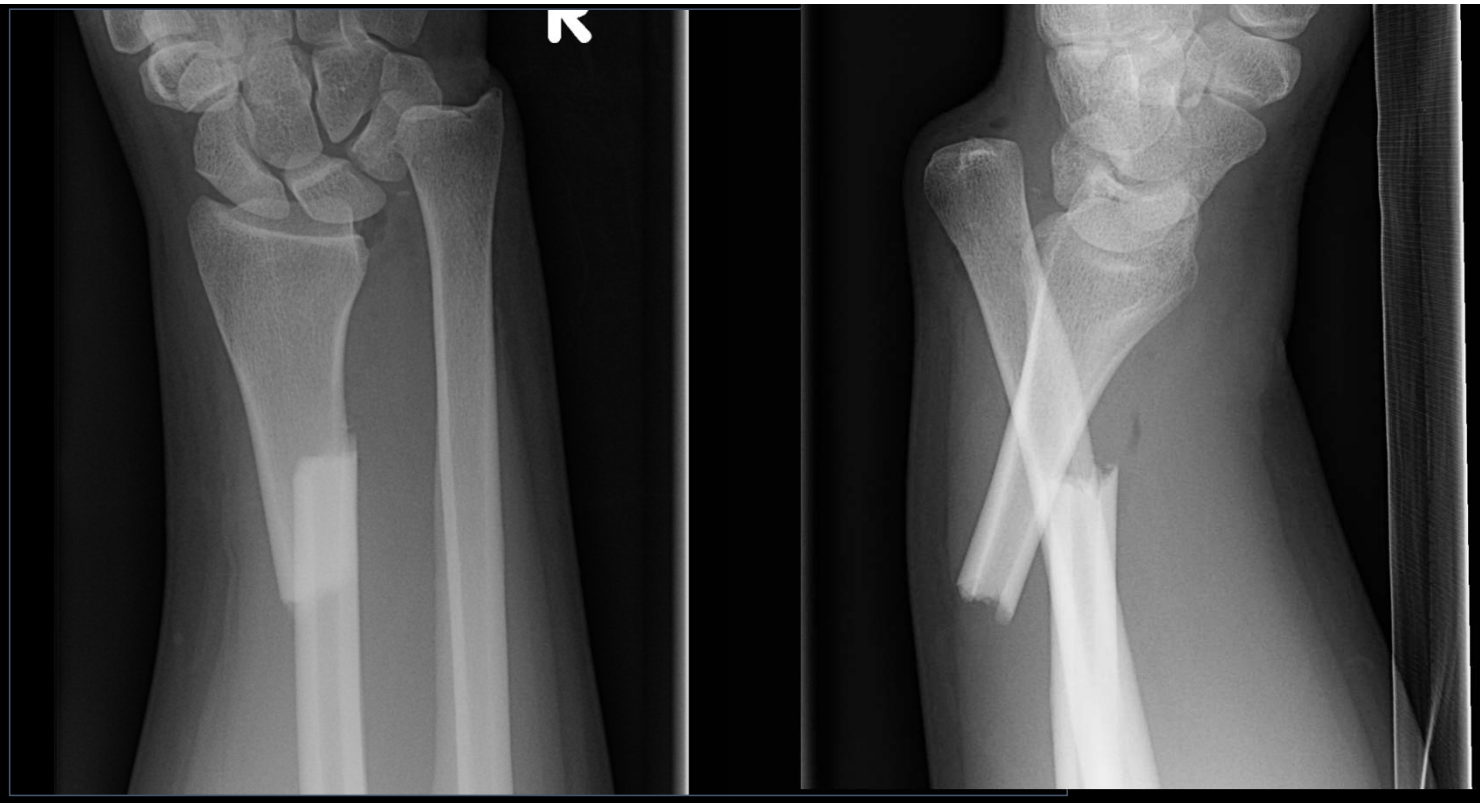
TIP: Radial nerve at risk for neuropraxia

Case #4

Young adult

Fall while playing sports

Right forearm and wrist pain with obvious deformity



GALEAZZI FRACTURE - DISLOCATION

Galeazzi Fracture - Dislocation

- Italian surgeon Ricardo Galeazzi
- Pattern: radial shaft fracture (middle/distal third) with associated dislocation of the distal radioulnar joint (DRUJ)
- MOI: FOOSH, forearm pronation or supination

TIP: Galeazzi equivalent is a more common fracture pattern in kids

- Radial shaft fx with ulnar physis displacement distally (DRUJ remains intact)

Case courtesy of Dr Alexandra Stanislavsky, Radiopaedia.org, rID: 10961

Case #5

30 yo

Assaulted with iron bar while trying to protect head

Left forearm pain

Nightstick Fracture

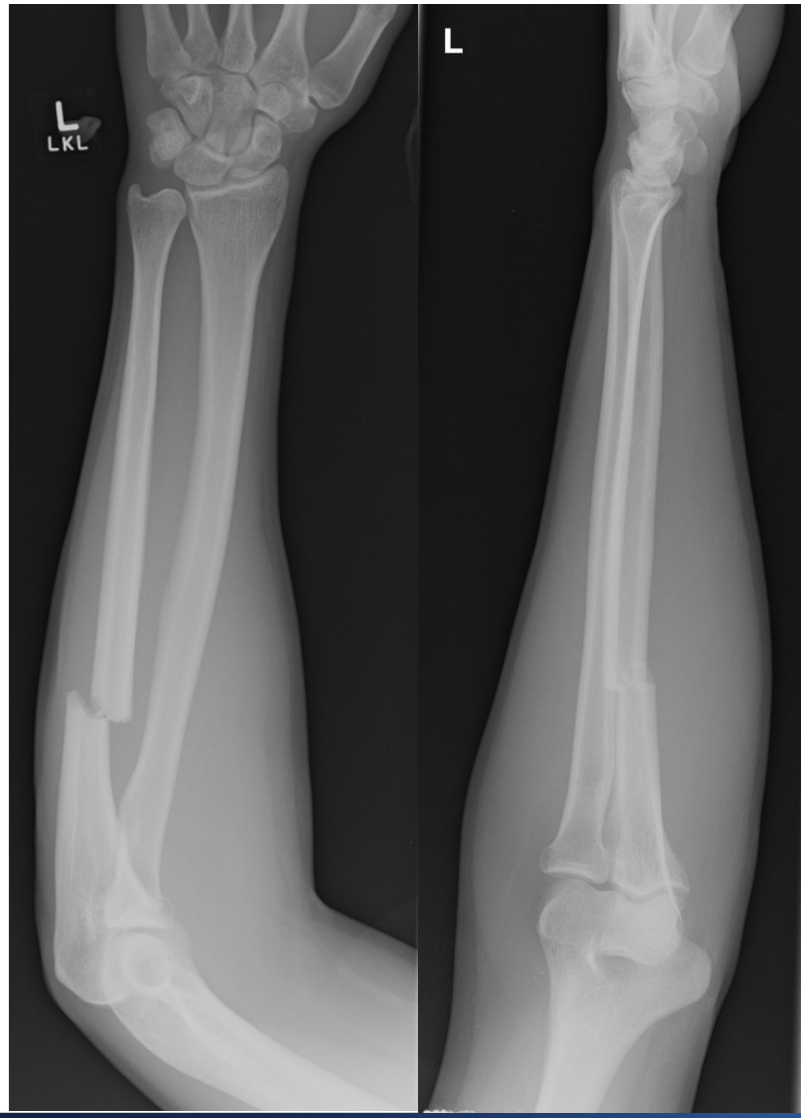
Nightstick Fracture

- Named after police baton (nightstick) impacting the midshaft of the ulna with a direct blow

- Pattern: isolated ulnar shaft fracture
  - Typically, transverse in midshaft

- MOI: direct impact of blunt object to the forearm often while attempting to block a blow to head
  - Must consider defensive wound, assault

TIP: When "isolated" ulnar shaft fx identified, formal elbow images are needed



Case courtesy of Assoc Prof Craig Hacking, Radiopaedia.org, rID: 53706

Case #6

Young boy

Fall

Right arm pain

MONTEGGIA FRACTURE - DISLOCATION

Monteggia Fracture-Dislocation

- Milanese surgeon Giovanni Battista Monteggia
- Pattern: **ulna** shaft (proximal third) fx with dislocation of radial head
- MOI: Direct blow to the ulna or FOOSH

TIP: Major medicolegal concern if missed

- Delayed management increase risk for long-term complications

Case courtesy of Assoc Prof Frank Gaillard, Radiopaedia.org, rID: 8012

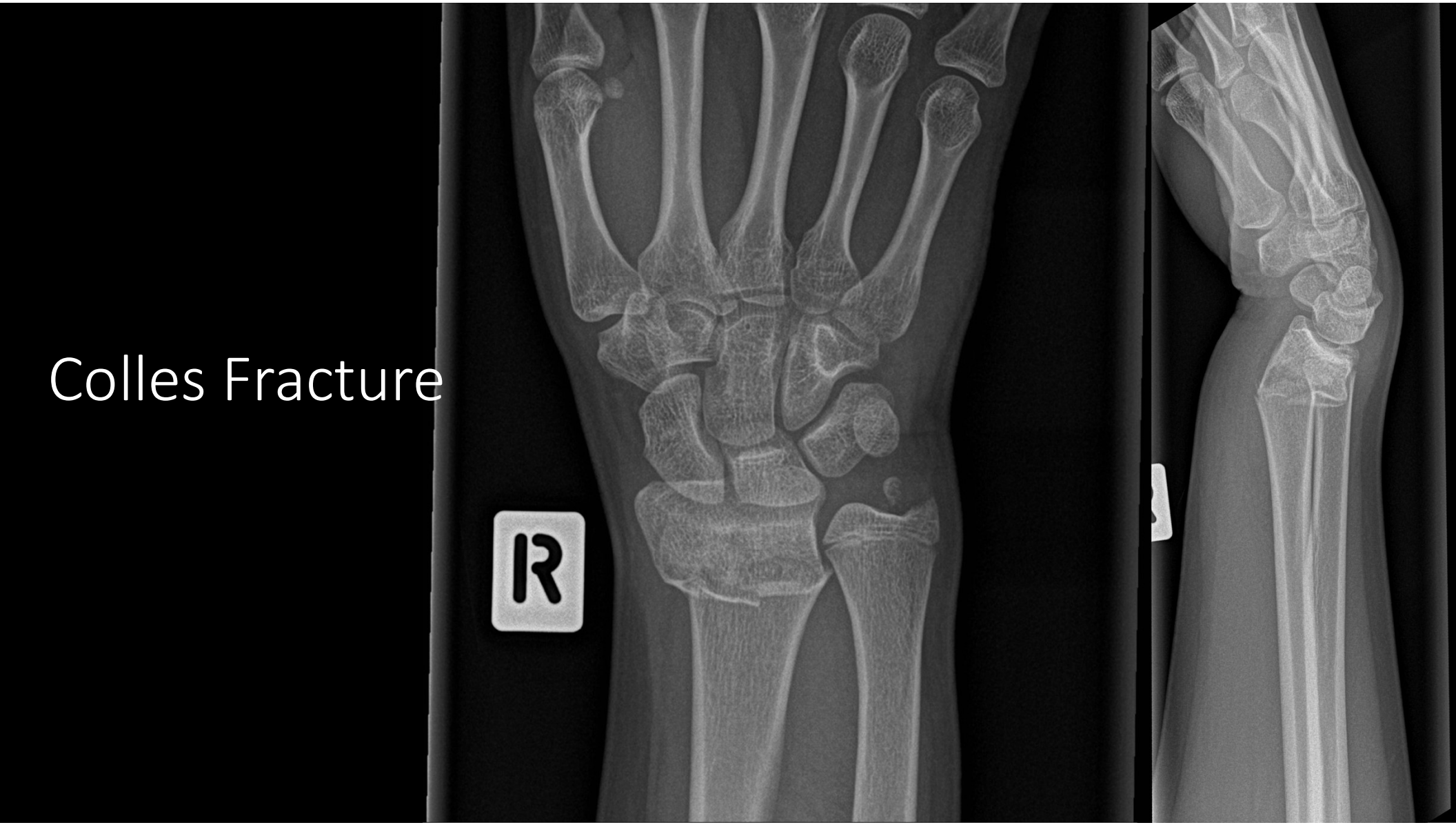
Case #7

Adult

Fall

Right wrist pain

Colles Fracture



Colles Fracture

- Irish surgeon Abraham Colles
- Pattern: extra-articular distal radius fracture with impaction and dorsal angulation/displacement
  - “dinner fork deformity”
- MOI: FOOSH or high impact trauma

TIP: 50% associated ulnar styloid fracture

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

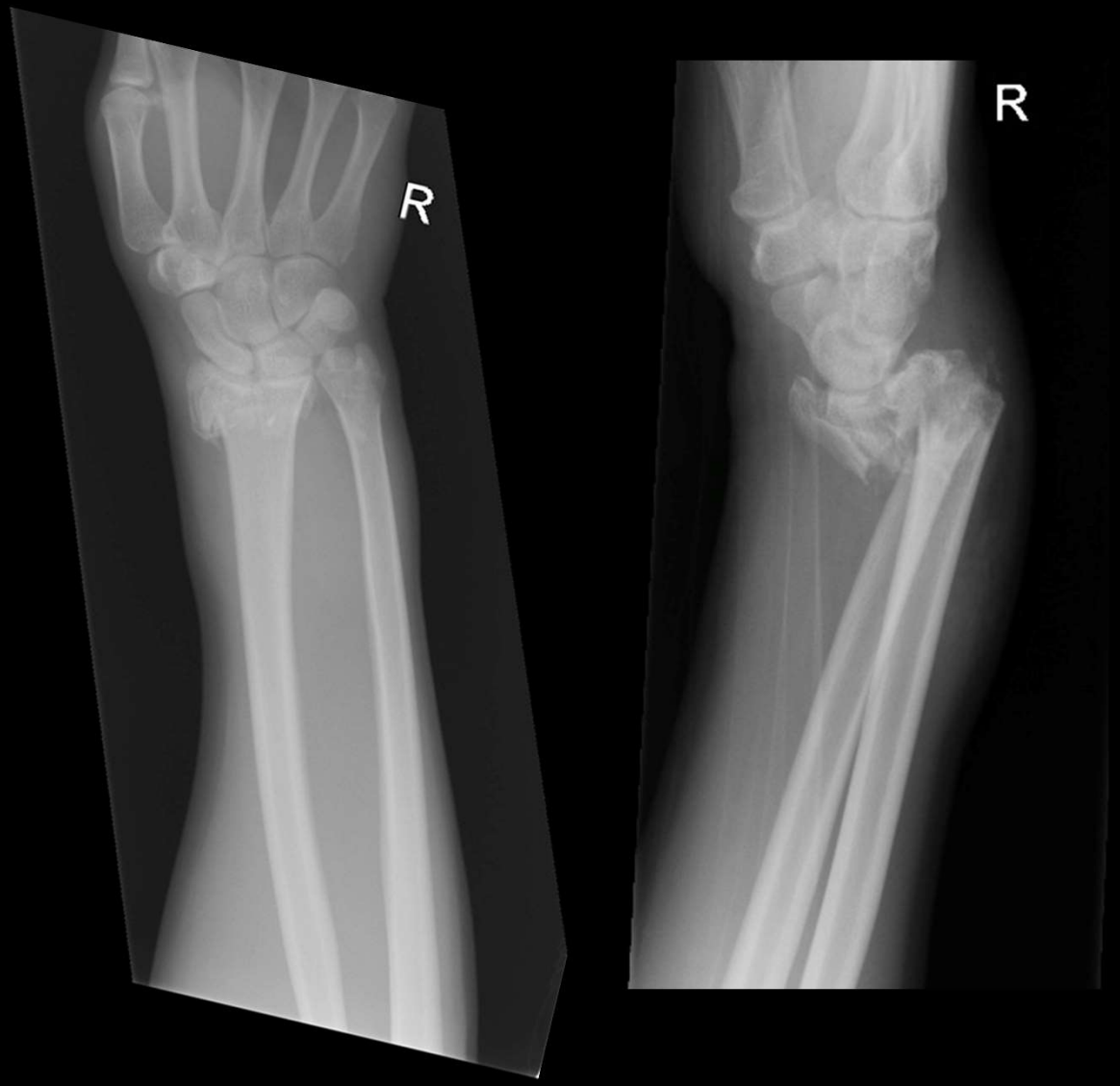
Case #8

35 yo

Slipped on ice and fell onto flexed wrist

Right wrist pain

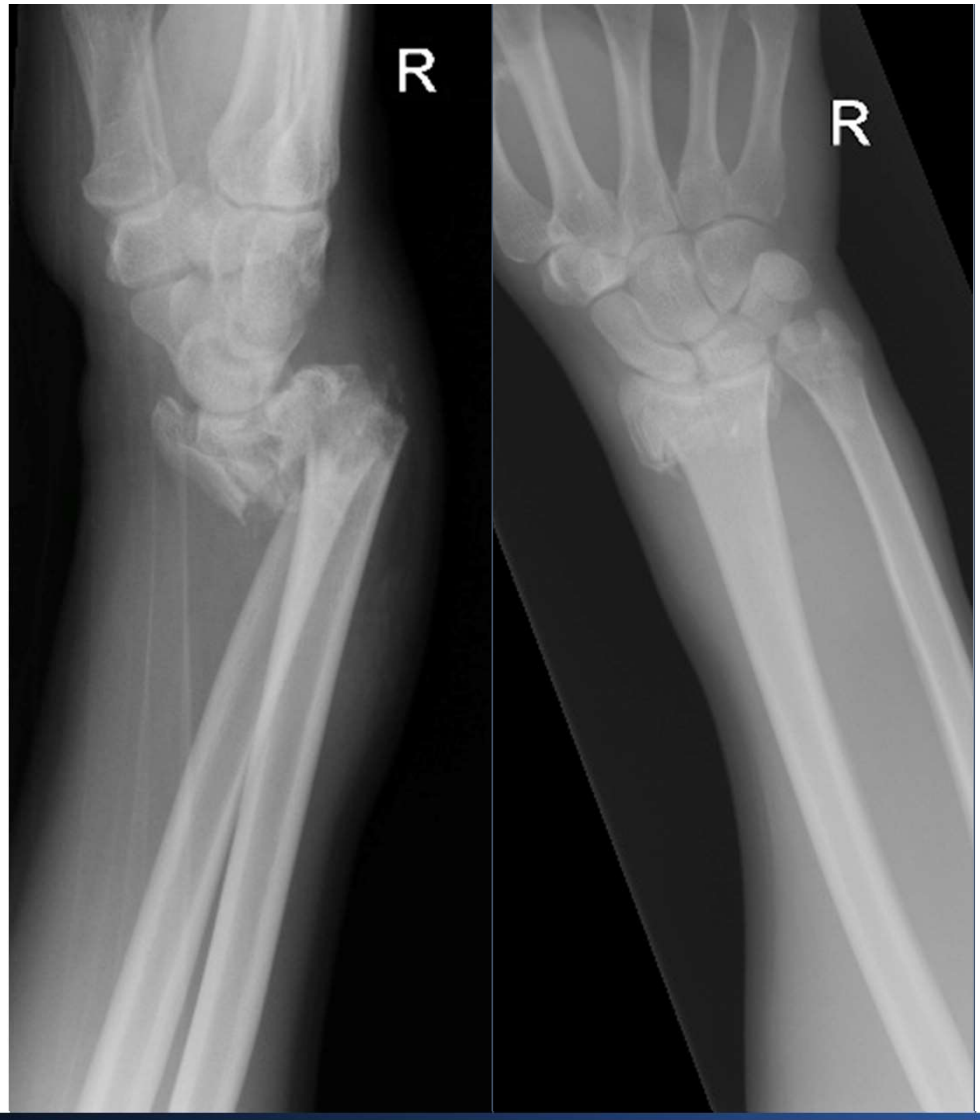
Smith Fracture



Smith Fracture

- Irish surgeon and pathologist Robert Smith
- Pattern: transverse distal radius fracture with volar angulation/displacement
- MOI: Fall on flexed wrist or dorsal impact

TIP: Most common type is extra-articular and commonly termed Reverse Colles



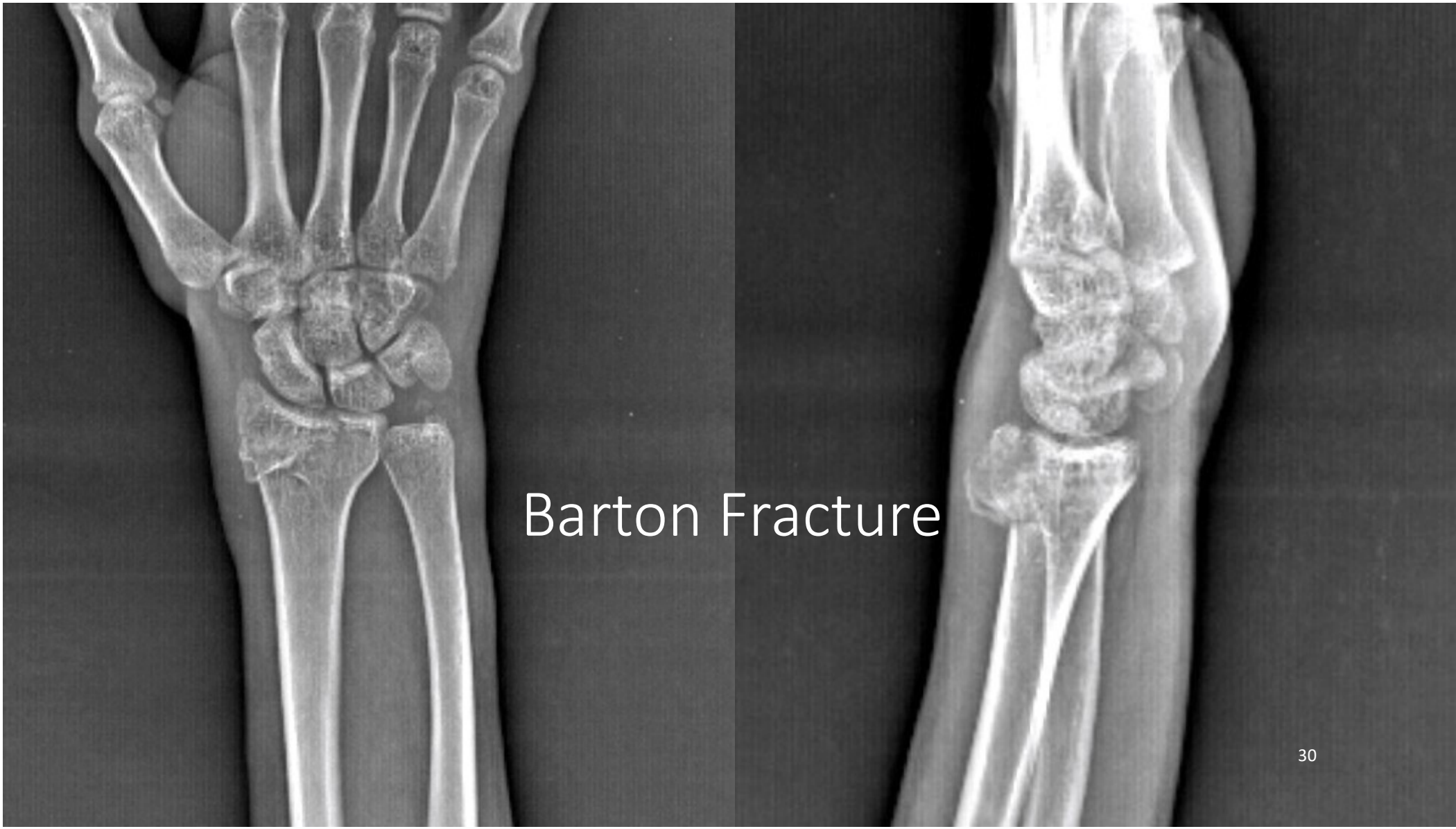
Case courtesy of Dr Jan Frank Gerstenmaier, Radiopaedia.org, rID: 25199

Case #9

30 yo

Fall

Right wrist pain


Barton Fracture

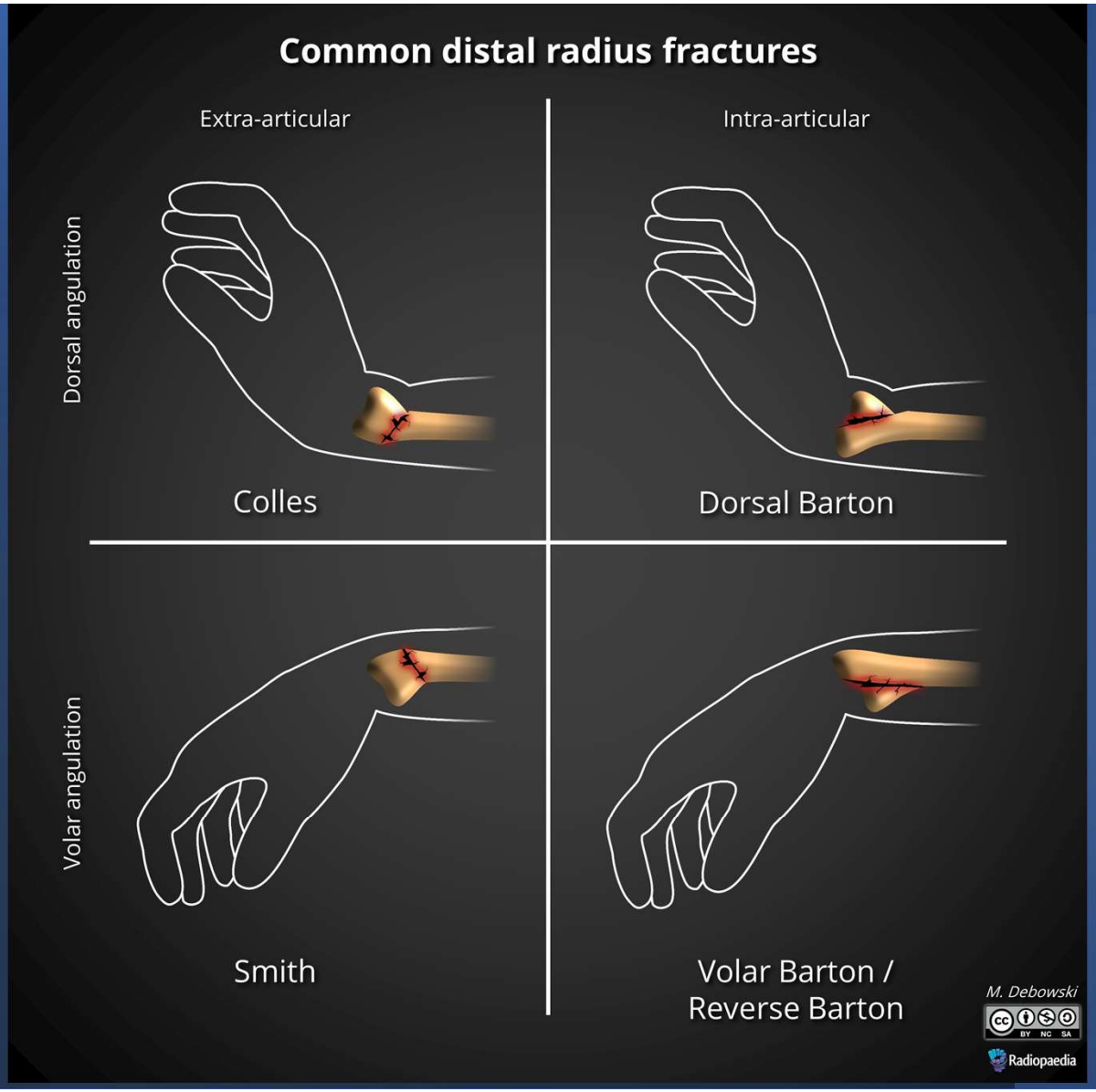
Barton Fracture

- American surgeon John Rhea Barton

- Pattern: oblique fracture of the distal radius with articular extension
  - **Dorsal-type**: Barton fracture
    - Colles with articular extension
  - **Volar-type**: reverse Barton fracture
    - Smith with articular extension

TIP: Often associated with dorsal subluxation/dislocation of radiocarpal joint

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



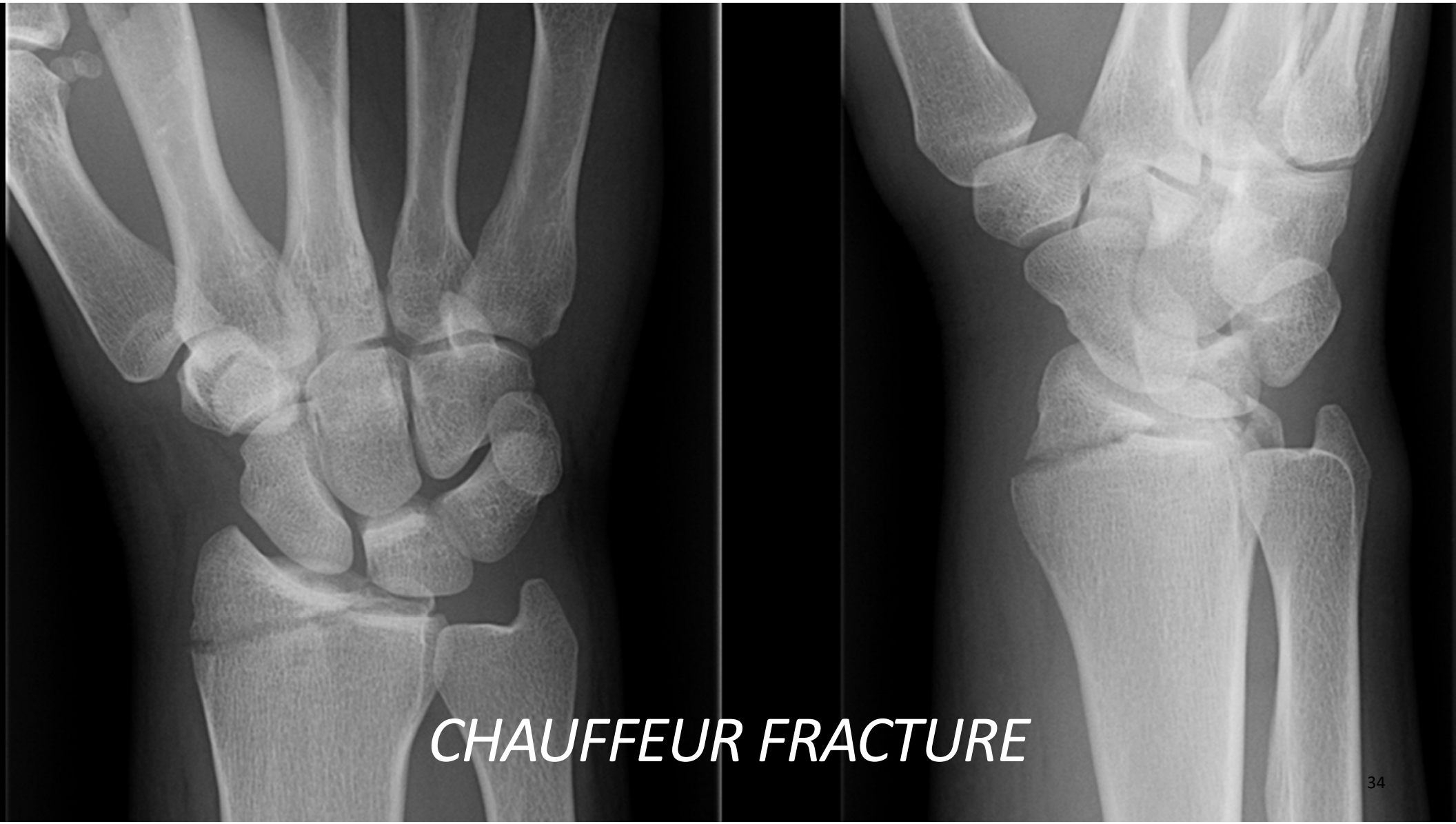
Case courtesy of Dr Maciej Debowski, Radiopaedia.org, rID: 66146

Case #10

30 yo

Fall from a horse

Right wrist pain



CHAUFFEUR FRACTURE

Chauffeur Fracture

- Also known as Hutchinson or Backfire
- British Surgeon, Johnathan Hutchinson
  - Named for injury sustained when using a hand crank and it jerks backs impacting wrist
- Pattern: intra-articular oblique fracture of radial styloid process
  - Scaphoid impacts radius
- MOI: direct trauma to dorsum of wrist or FOOSH

TIP: May be considered avulsion fracture as the radiocarpal ligaments remain attached to styloid

Case courtesy of Dr Alexandra Stanislavsky, Radiopaedia.org, rID: 12360

Case #11

30 yo

Trauma

Left thumb and hand pain


Bennett
Fracture

Bennett Fracture

- Irish surgeon, Edward Bennett
- Pattern: intra-articular oblique fracture at the base of the first metacarpal
  - Associated with subluxation or dislocation of carpometacarpal joint
- MOI: axial trauma with partially flexed metacarpal

TIP: Consider a different eponym if > 2 parts

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

Case #12

40 yo

Trauma

Right thumb and hand pain

Rolando Fracture

Rolando Fracture

- Silvio Rolando
- Pattern: comminuted intra-articular first metacarpal base fracture
  - > 2 parts
- MOI: axial trauma with partially flexed metacarpal

TIP: unstable fx typically requiring surgery with hand specialist

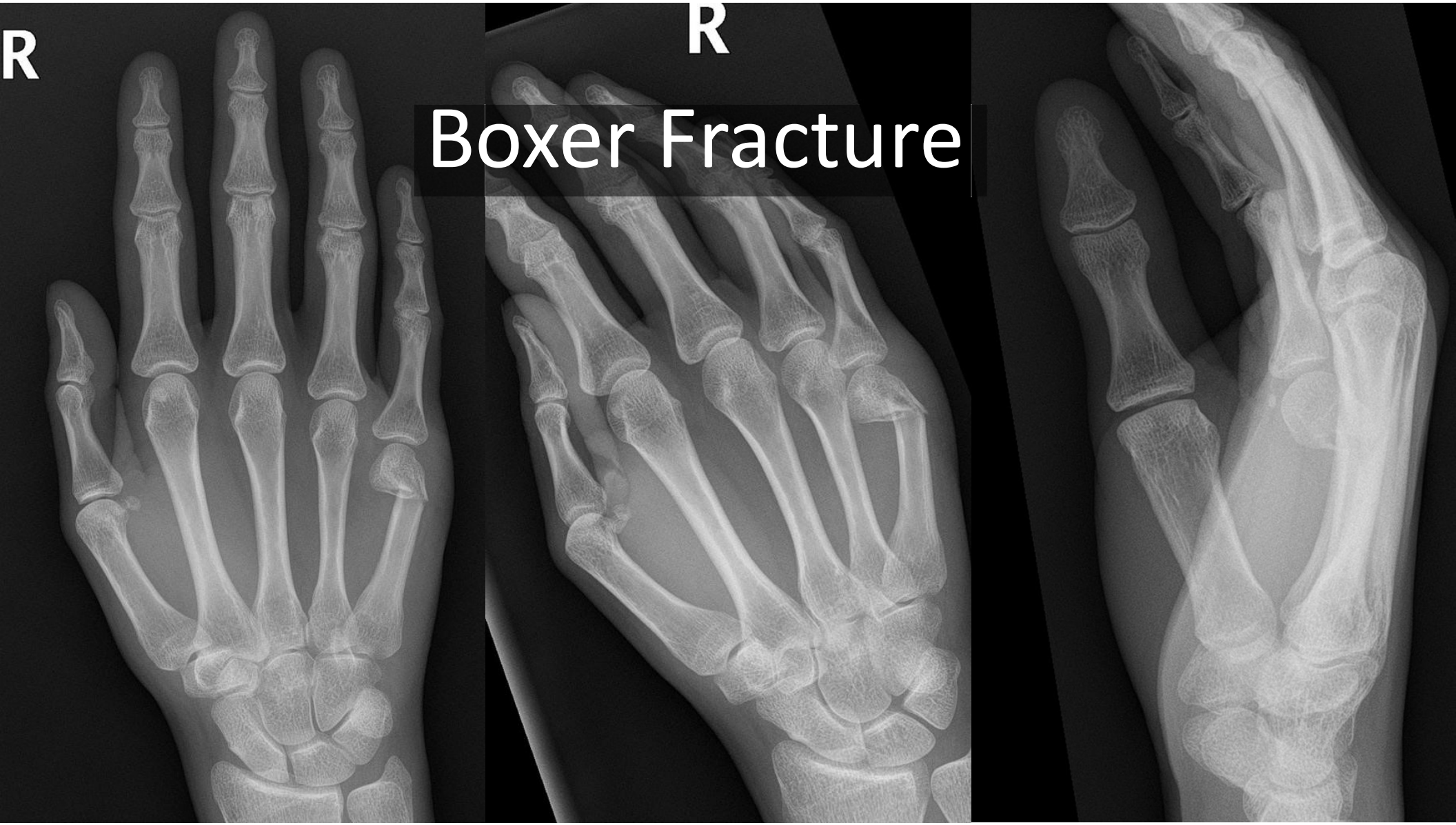
Case courtesy of Dr Maulik S Patel, Radiopaedia.org, rID: 48712

Case #13

25 yo

Punched wall

Right ulnar-sided hand pain


R
R
Boxer Fracture

Boxer Fracture

- Named attributed to MOI typically caused by punching with a closed fist

- Pattern: Transverse fracture of 5th MC neck
  - Must assess amount of volar angulation and rotation to determine management

- MOI: direct blow with clenched fist

TIP: Long-term effects may include loss of prominence to the the knuckle and potential overlapping of digits if rotation deformity

Case courtesy of Dr Henry Knipe, Radiopaedia.org, rID: 26184

Upper Extremity Take Home Points

What two injuries are commonly associated with anterior shoulder dislocations?	
What is the pattern of the fracture with a high risk of radial neuropraxia?	
Compare the three named forearm fractures discussed?	
What is the difference between the named wrist fractures discussed?	
What differentiates the two 1st MC base fractures?	

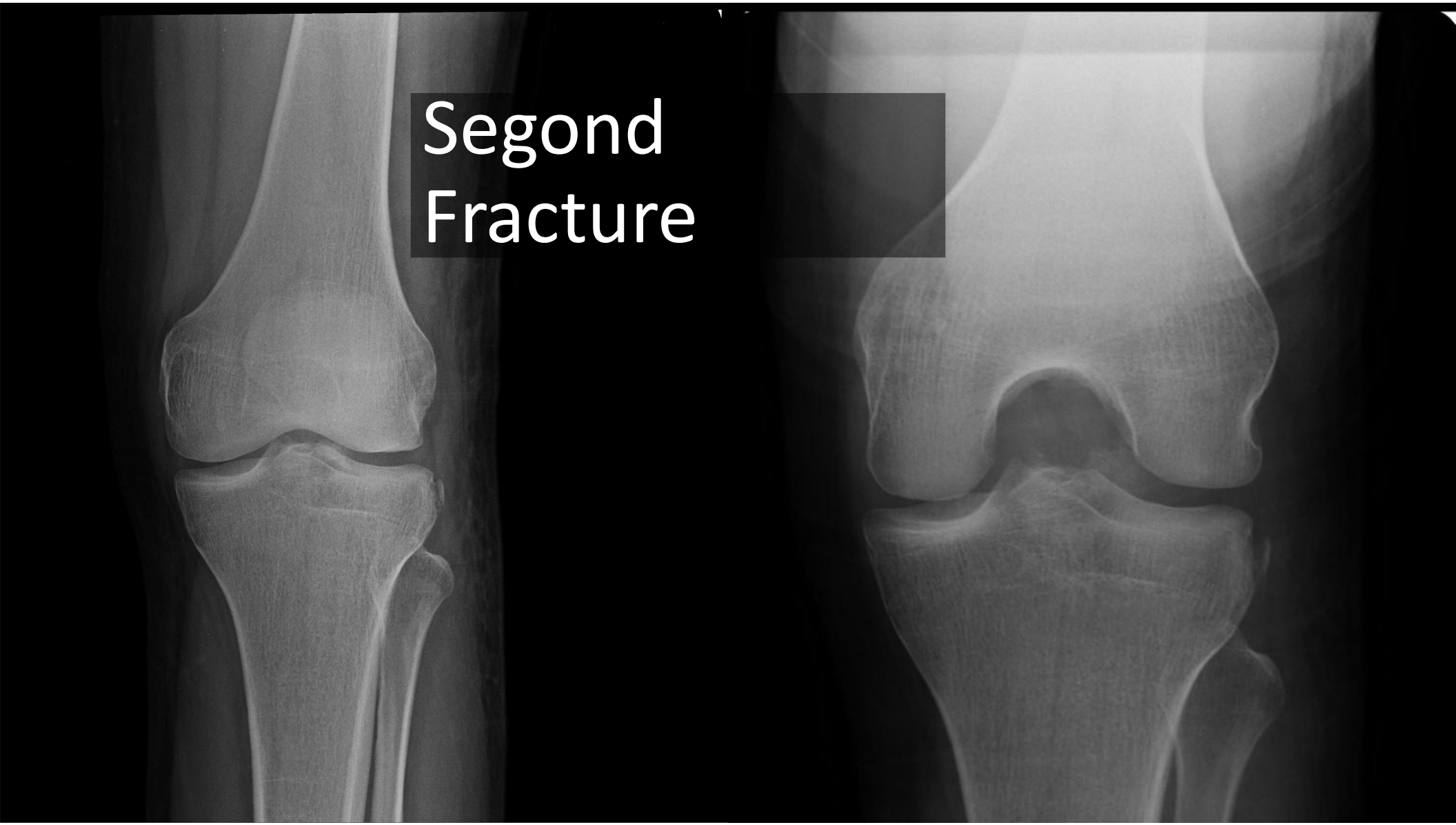
Lower Extremity Eponymous Fractures

CASE #14

Adult

Left knee trauma

Acute nonspecific pain


Segond
Fracture

Segond Fracture

- French surgeon Paul Segond
- Pattern: avulsion fracture of the proximal lateral tibia (inferior to the tibial plateau)
- MOI: internal rotation of the knee with varus stress

TIP: frequent association with **ACL tears**, meniscal tears, and other soft tissue injuries

- MR imaging of the knee

Case courtesy of Dr Maulik S Patel, Radiopaedia.org, rID: 9758

Case #15

30 yo

Slipped down the stairs

Right lower leg pain

Maisonneuve Fracture

Maisonneuve Fracture

- French surgeon Jacque Gilles Maisonneuve

- Pattern: spiral fracture of the proximal fibula with associated unstable ankle injury
  - Disruption of the distal tibiofibular syndesmosis +/- medial malleolus fx, and interosseous tear
  - May have widening at ankle mortise

- MOI: force on externally rotated ankle with a pronated foot

TIP: Always assess proximal fibula with ankle injuries to avoid missing this injury

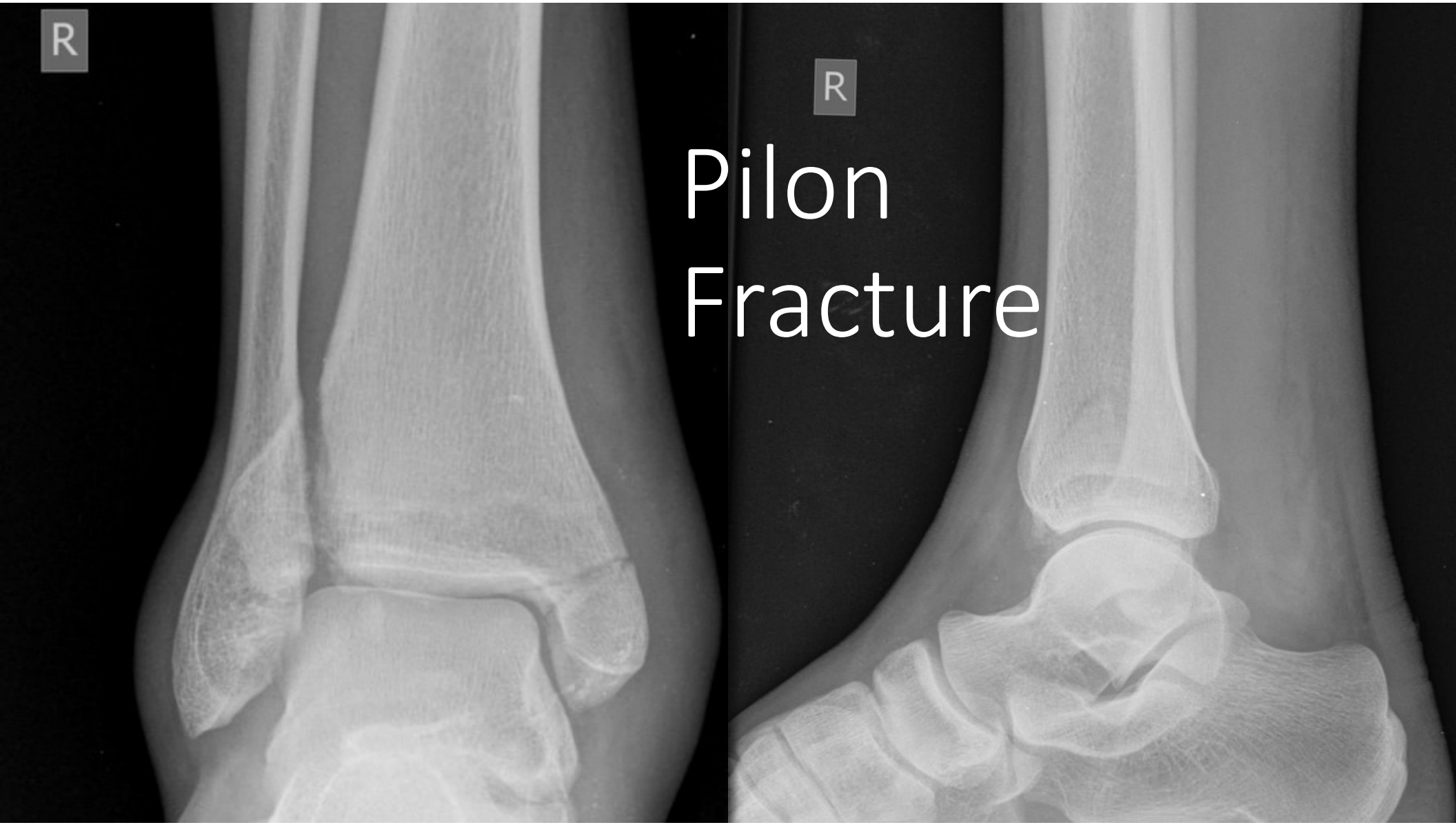
Case courtesy of RMH Core Conditions, Radiopaedia.org, rID: 29088

Case #16

30 yo

MVA

Right ankle pain



Pilon Fracture

Pilon

- Named after the French word for pestle which is used for crushing with a mortar
- Pattern: tibial plafond intra-articular fracture
- MOI: axial load
  - Talus impacting tibia

TIP: CT scan may be beneficial to define fracture pattern and severity

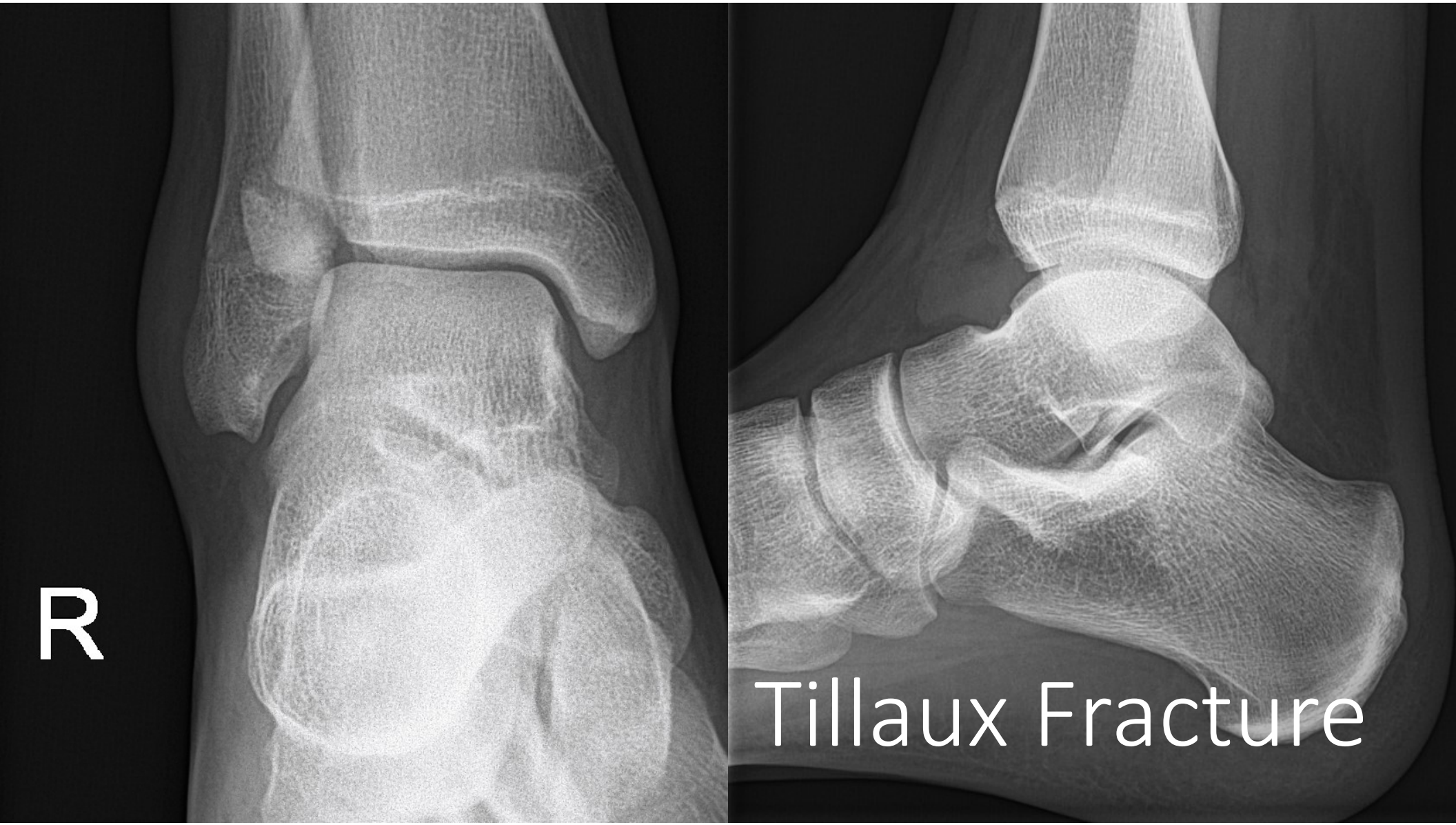
Case courtesy of Dr Subhan Iqbal, Radiopaedia.org, rID: 80011

Case #17

16 yo

Fall and unable to bear weight

Right ankle pain


R
Tillaux Fracture

Tillaux Fracture

- French surgeon Paul Tillaux

- Pattern: fracture of the anterolateral tubercle of the distal tibia
  - Salter Harris Type III

- MOI: pull of the anteroinferior tibiofibular ligament in abduction/external rotation
  - Fracture requires an open physis: Adolescent injury

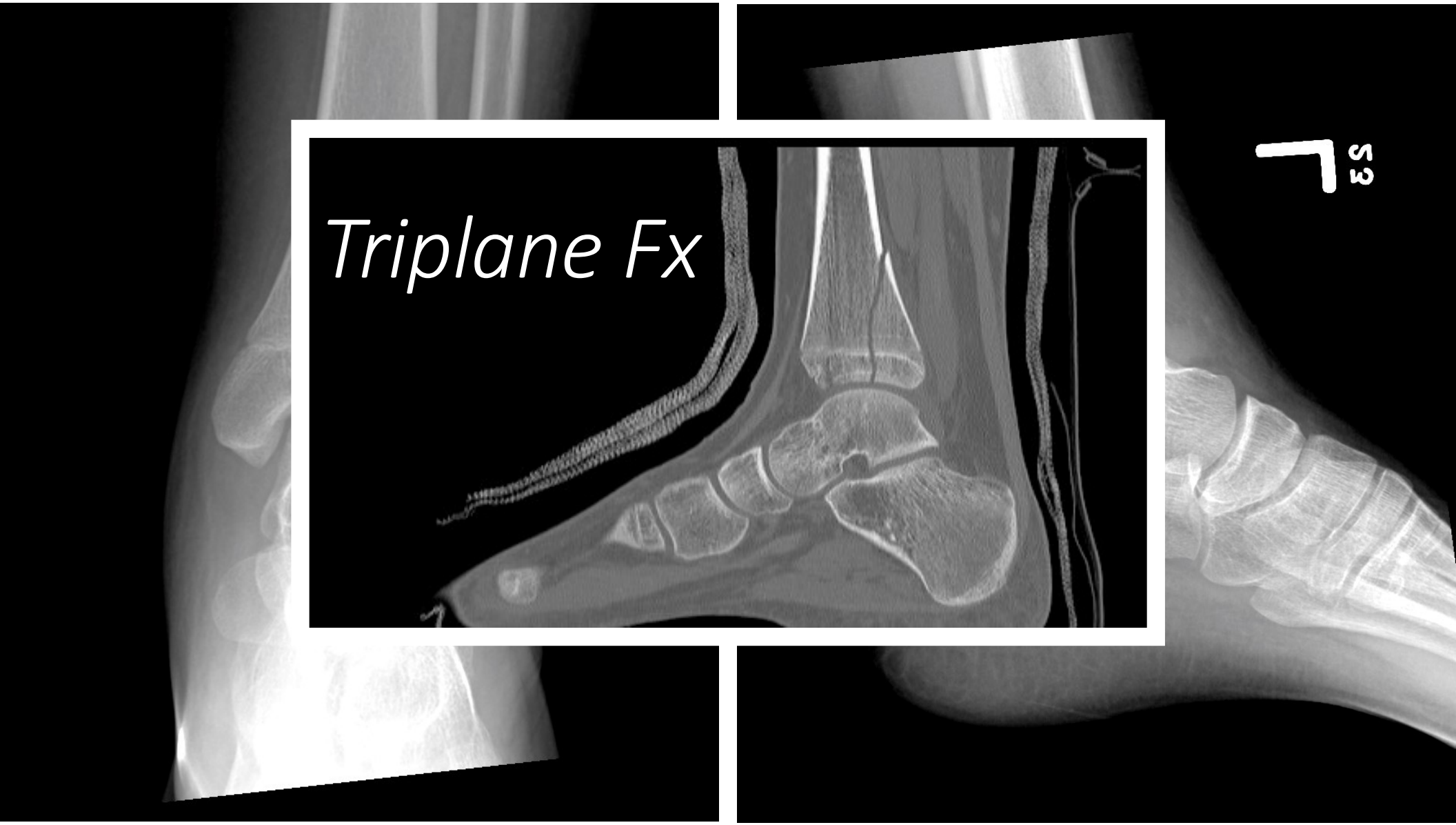
TIP: If metaphyseal involvement consider Triplane fracture (SH Type IV)

Case #18

15 yo

Twist injury

Left ankle pain


Triplane Fx

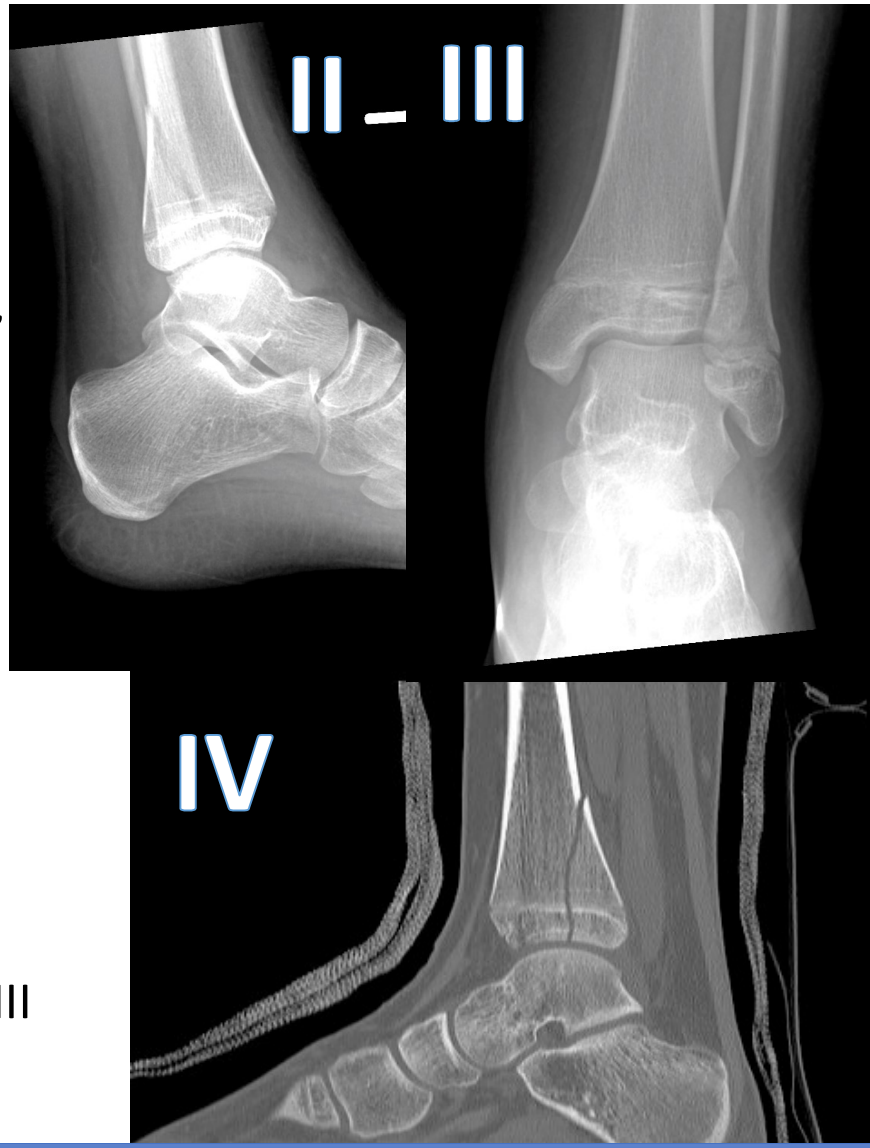
Triplane Fx

- Name reflects the injury extending along the frontal, lateral, and transverse planes

- Pattern: SH IV fracture of the distal tibia
  - Epiphysis: vertical fx
  - Physis: horizonal fx
  - Metaphysis: oblique fx

- MOI: External rotation and supination injury in adolescents as epiphyseal plate is closing

TIP: Fractures appear as a SH II on lateral view and SH III on AP view



Case courtesy of Dr Yasser Asiri, Radiopaedia.org, rID: 64779

Case #19

3 yo

Jumped off sofa

Unable to bear weight on the right

Toddler Fracture

Toddler Fracture

- Named for typical age for injury to occur
  - Ambulatory child between 9 months - 3 years

- Pattern: minimal or nondisplaced tibia spiral or oblique fracture
  - Typically, 9 months - 3 years

- MOI: falling while running/twisting mechanism
  - SLIDES!

TIP: Fracture is commonly subtle or occult on initial radiographs.

Case courtesy of Dr Jeremy Jones, Radiopaedia.org, rID: 23981

FACEBOOK/HEATHER CLARE

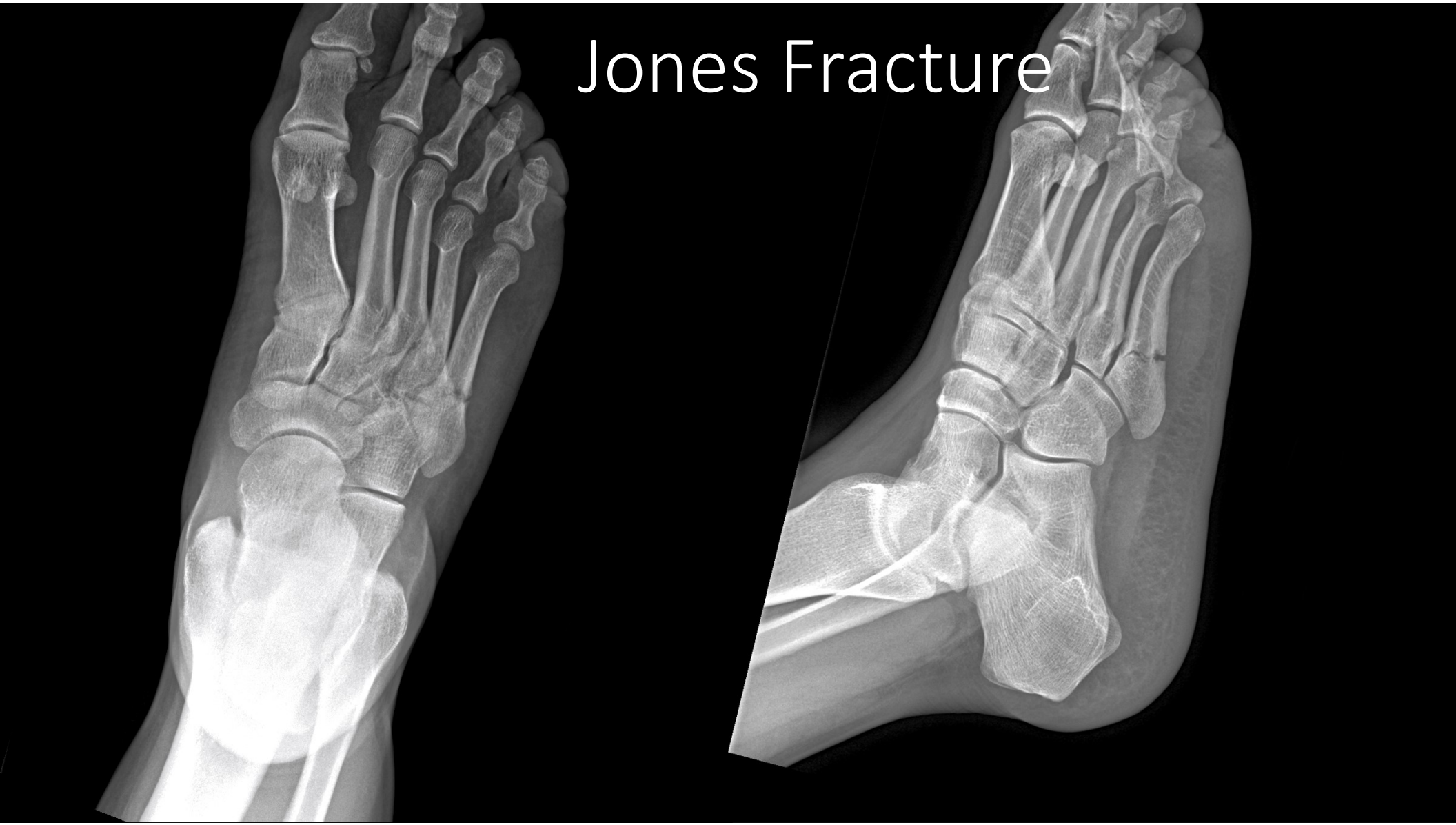
Case #20

35 yo

Trauma

Right lateral foot pain

Jones Fracture



Jones Fracture

- Welsh Orthopaedic Surgeon Sir Robert Jones
- Pattern: transverse fracture at the metadiaphyseal junction without proximal articular extension of the fracture
  - Pseudo-Jones: intra-articular oblique/avulsion fracture of the fifth metatarsal base
- MOI: plantarflexion with adduction force to forefoot

Tip: Higher rate of nonunion, delayed union, or refracture due to the watershed blood supply

Case courtesy of Dr Matt Skalski, Radiopaedia.org, rID: 35716

Lower Extremity Take Away Points	
What injury is most commonly associated with a Segond fracture?	
What two injuries create a Maisonneuve fracture?	
What SH classification is a Tilleaux fracture?	
Which injury at the 5th MT has an increased risk for nonunion?	
What is the most common SH classification?	

Quick Comparisons

Colles

Barton

Night Stick

Monteggia

Jones

Pseudo-Jones

Case courtesy of Dr Mostafa El-Feky, Radiopaedia.org, rID: 78523

Case courtesy of Dr Servet Kahveci, Radiopaedia.org, rID: 881

Bennett

Rolando

Final Tips

1. Correlate with clinical findings.
2. Document potential associated injuries.
3. Describing a fracture is far more important than the unique name!

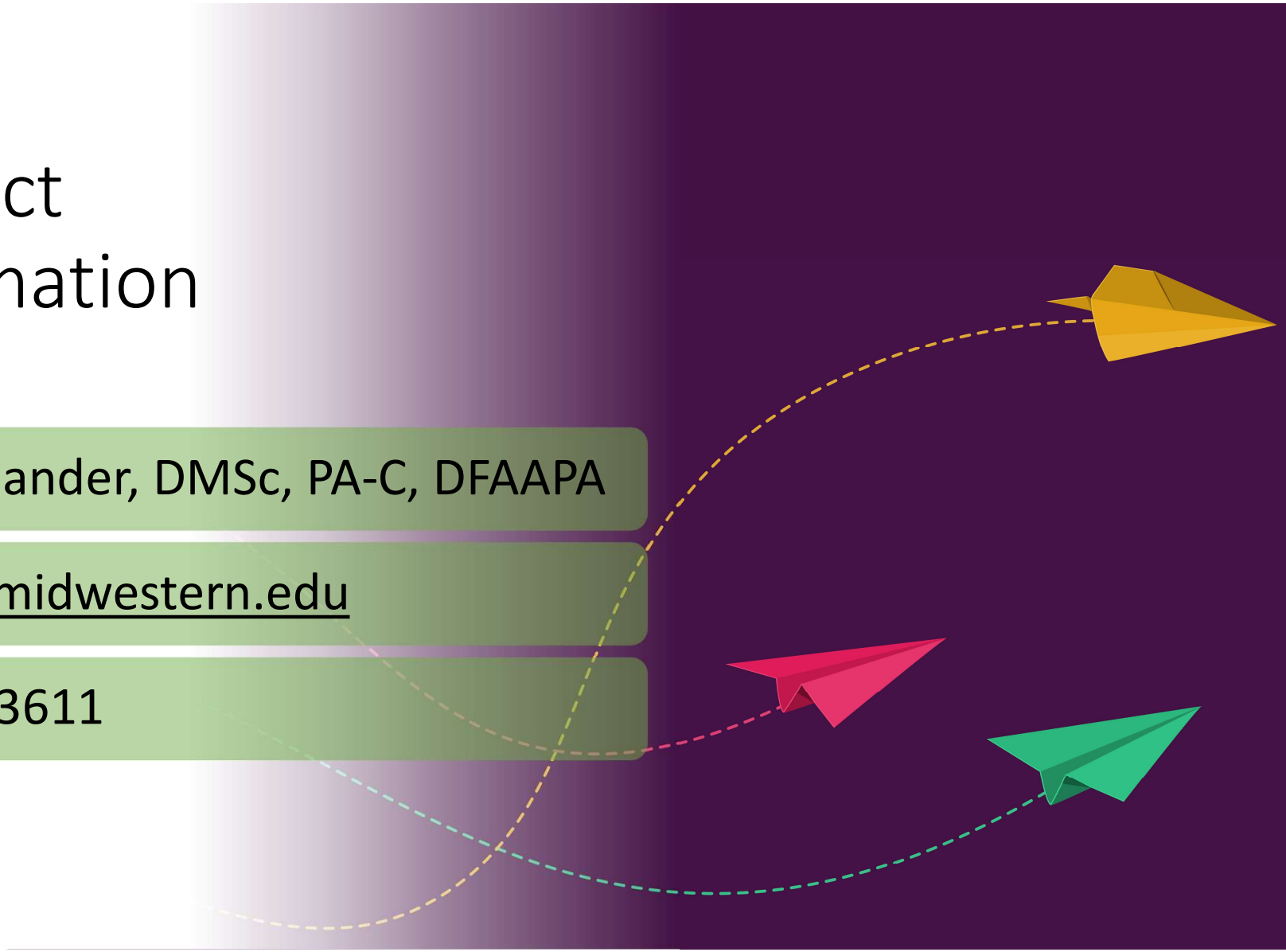

Thanks!

Contact Information

Sarah Bolander, DMSc, PA-C, DFAAPA

sbolan@midwestern.edu

623-572-3611



References

1. Espinosa JA, Nolan TW. Reducing errors made by emergency physicians in interpreting radiographs: longitudinal study. BMJ. 2000;320(7237):737-740.
2. 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.
3. Bolander, S. A systematic approach to describing fractures. JAAPA. 2019;32(5):23-29.
4. Martin J, Marsh JL, Nepola JV, Dirchl DR, Hurwitz S, DeCoster TA. Radiographic fracture assessments: which ones can we reliably make? J Orthop Trauma. 2000;14(6):379-385.
5. Nguyen JC, Markhardy BK, Merrow AC, Dwek JR. Imaging of pediatric growth plate disturbances. Radiographics. 2017;37(6):1791-1812.
6. Wong PK, Hanna TN, Shuaib W, et al. What's in a name? Upper extremity fracture eponyms (part 1). Int J Emerg. 2015;8:27.
7. Wong PK, Hanna TN, Shuaib W, et al. What's in a name? Lower extremity fracture eponyms (part 2). Int J Emerg. 2015;8:25.

Resources

- AAOS: http://www.aaos.org/
- POSNA: https://posna.org/
- AAFP: http://www.aafp.org/
- Radiopaedia: http://radiopaedia.org/
- OrthoBullets: https://www.orthobullets.com