

# Scaphoid fractures are easy to detect and manage



[http://commons.wikimedia.org/wiki/File:Scaphoid\\_bone\\_%28left\\_hand%29\\_-\\_animation02.gif](http://commons.wikimedia.org/wiki/File:Scaphoid_bone_%28left_hand%29_-_animation02.gif)

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# SCAPHOID FRACTURES

- Overview
- Anatomy
- Mechanism and Classification
- Clinical Assessment
- Imaging
- Management (for undisplaced waist fractures)
- Case Studies

# WELCOME



# SCAPHOID FRACTURES



# SCAPHOID FRACTURES

## OVERVIEW

# Overview

- Assess the patient as a whole and not just the wrist / scaphoid – joint above and below
- Don't miss other injuries



# Overview

- Scaphoid fractures are a diagnostic challenge
- Scaphoid is the most commonly injured carpal bone
  - 82-89% of all carpal fractures (Rhemrev et al, 2011)
  - 2% of all fractures (Larsen et al, as cited by Cheung et al, 2006)

# Overview

- Snowboarding wrist fractures (Idzikowski et al, 2000):
  - Scaphoid 4%
  - Distal radius and ulna 95%





# Overview

- Uncommon in very young and very old due to the relative weakness of the distal radius in these groups

(Guttierrez as cited by Phillips et al, 2004).



# Overview

- Untreated fractures of the scaphoid are significantly more likely to develop:
  - delayed union
  - non-union
  - avascular necrosis
  - decreased grip strength and range of motion
  - collapse and / or osteoarthritis of the radiocarpal joint

(Greene as cited by Phillips et al, 2004).



<http://www.radiologytutorials.com/getimage.cgi?i=bilder/2/288-1&r=1400>

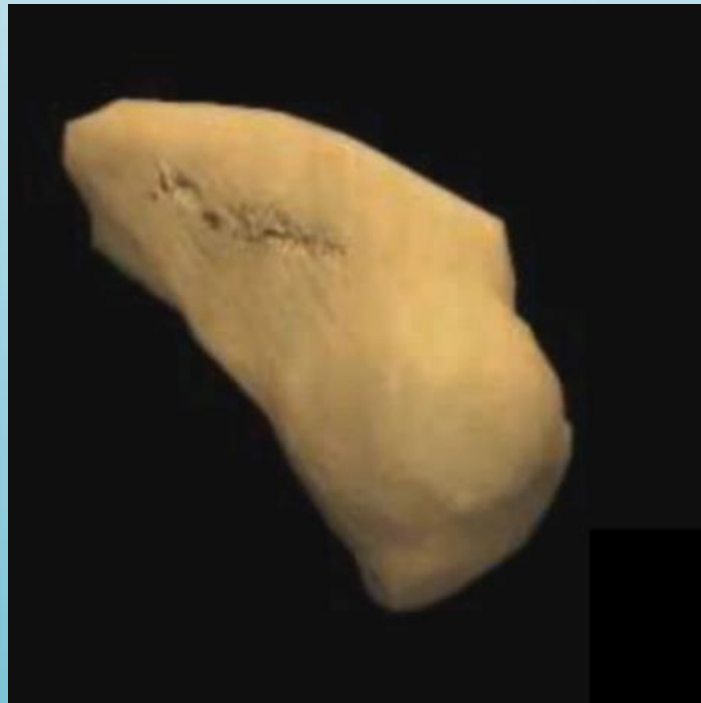
Scapholunate Advanced Collapse

# SCAPHOID FRACTURES

ANATOMY

# Anatomy

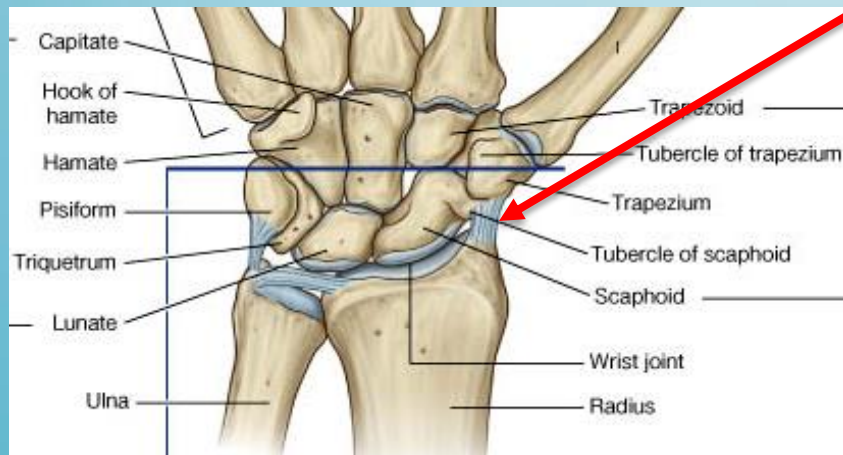
- 80% of the surface is covered with articular cartilage, leaving little area for vascular supply



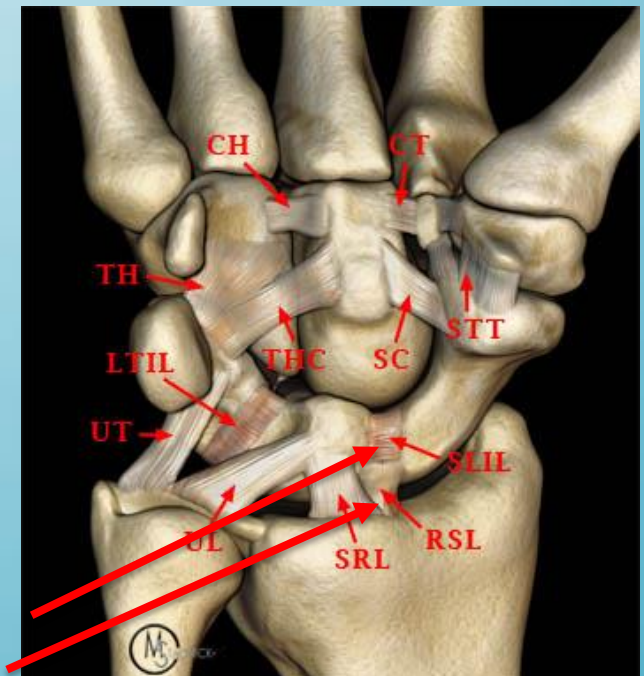
(Rhemrev et al, 2011)

# Anatomy

- Scaphoid articulates with the distal radius, lunate, trapezium, trapezoid and capitate.



Radial Collateral Ligament



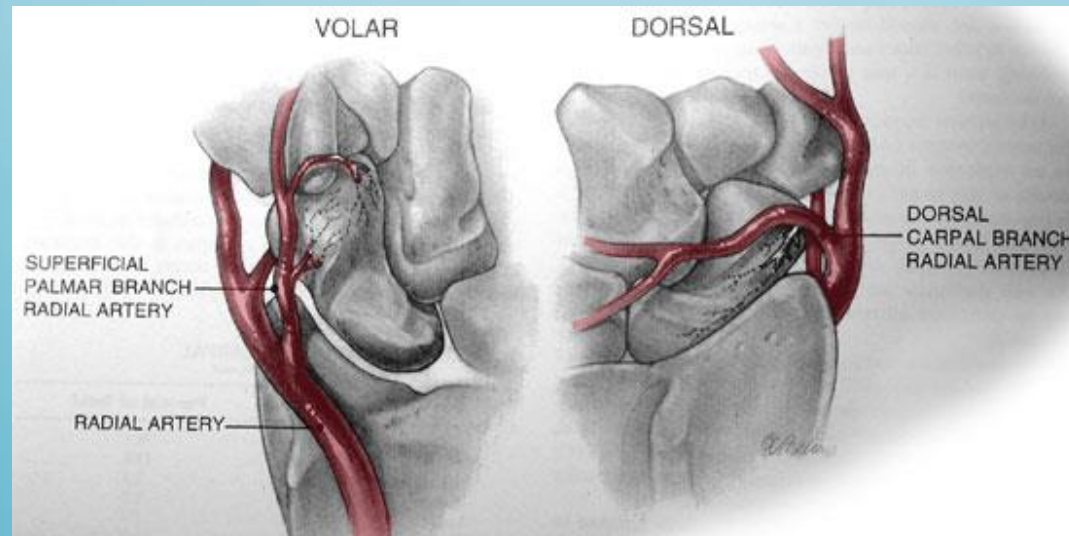
Scapholunate Interosseous Ligament

Radioscaphoid Ligament

# Anatomy

- Radial artery sends retrograde branches to supply the scaphoid with the proximal portion having no direct blood supply

(Phillips et al, 2004; Gelberman as cited by Rhemrev, 2011)



# Anatomy

- Resulting poor blood supply often results in non-union to proximal scaphoid fractures

(Phillips et al, 2004; Gelberman as cited by Rhemrev 2011)



<http://www.wheelessonline.com/image5/i1/scphn1.jpg>



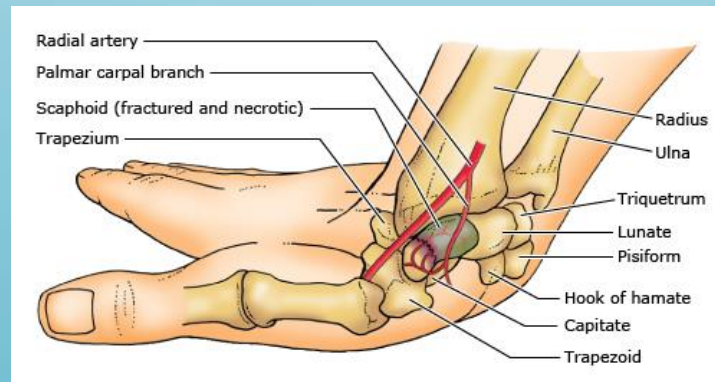
# Anatomy

- The close packed position of the wrist is full extension

(Norkin and Levangie 5<sup>nd</sup> ed., 2010)

- In full extension, the proximal pole of the scaphoid becomes compressed between the radius and the capitate

(Weber and Chao, 1978 as cited by Farnell and Dickson, 2010)





# SCAPHOID FRACTURES

## MECHANISM AND CLASSIFICATION

# Mechanism

- Most common mechanism is FOOSH

(Hove, 1999 as cited by Stevenson et al, 2011).



[http://www.youtube.com/watch?v=BjLiGqC\\_YsI](http://www.youtube.com/watch?v=BjLiGqC_YsI)

# Mechanism

Mechanism	Percent
Fall on outstretched hand	59
Road traffic accident	12
Direct blow	7
Forced hyperextension	5
Starting handle kickback	3
Fall on dorsum of hand	3
Unclassifiable	11

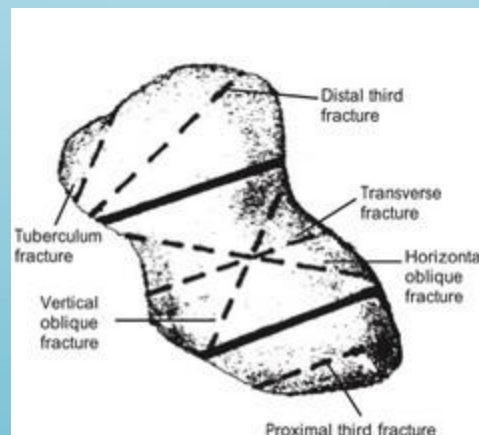
(Clay et al, 1991)



# Classification

Fracture Type	Incidence	Union rate
Waist	80% <sup>1</sup>	Undisplaced:90-98% <sup>2,3,4</sup> Displaced: 50-69% <sup>3,4</sup>
Proximal third	15% <sup>1</sup>	40-69%% <sup>2,3</sup>
Distal third	4% <sup>1</sup>	100% <sup>3</sup>
Distal tubercle	1% <sup>1</sup>	100% <sup>3</sup>

(<sup>1</sup>Eiff et al, 1998; <sup>2</sup>Clay et al, 1991; <sup>3</sup> Farnell and Dickson, 2010; <sup>4</sup> Geoghegan et al, 2009)



<http://morphopedics.wdfiles.com/local--resized-images/scaphoid-fractures/Types.jpg/small.jpg>

# SCAPHOID FRACTURES

## ASSESSMENT



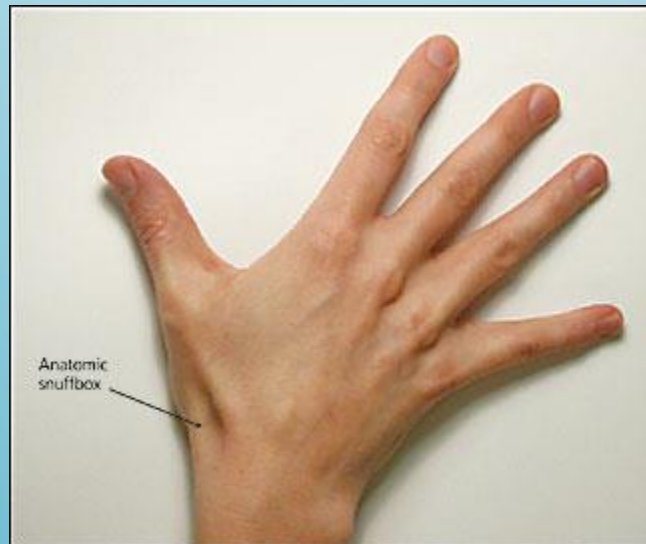
# Assessment



# Assessment

- Comprehensive Sx / Ox Assessment
- “Snuff Box Tenderness”
  - Traditionally the major assessment used to assess for scaphoid injury

**BUT IS THAT ENOUGH??**





# Assessment

- Clinical tests

Signs	Sensitivity	Specificity
Snuff Box Tenderness <sup>1,2</sup>	90-100%	9-40%
Scaphoid Tubercle Tenderness <sup>1,2</sup>	87%-100%	30-57%
Pain on Axial Compression Through the First Metacarpal <sup>2</sup>	100%	48%
Two or More of First Three Tests <sup>2</sup>	100%	54%
First Three Tests Combined <sup>2</sup>	100%	75%

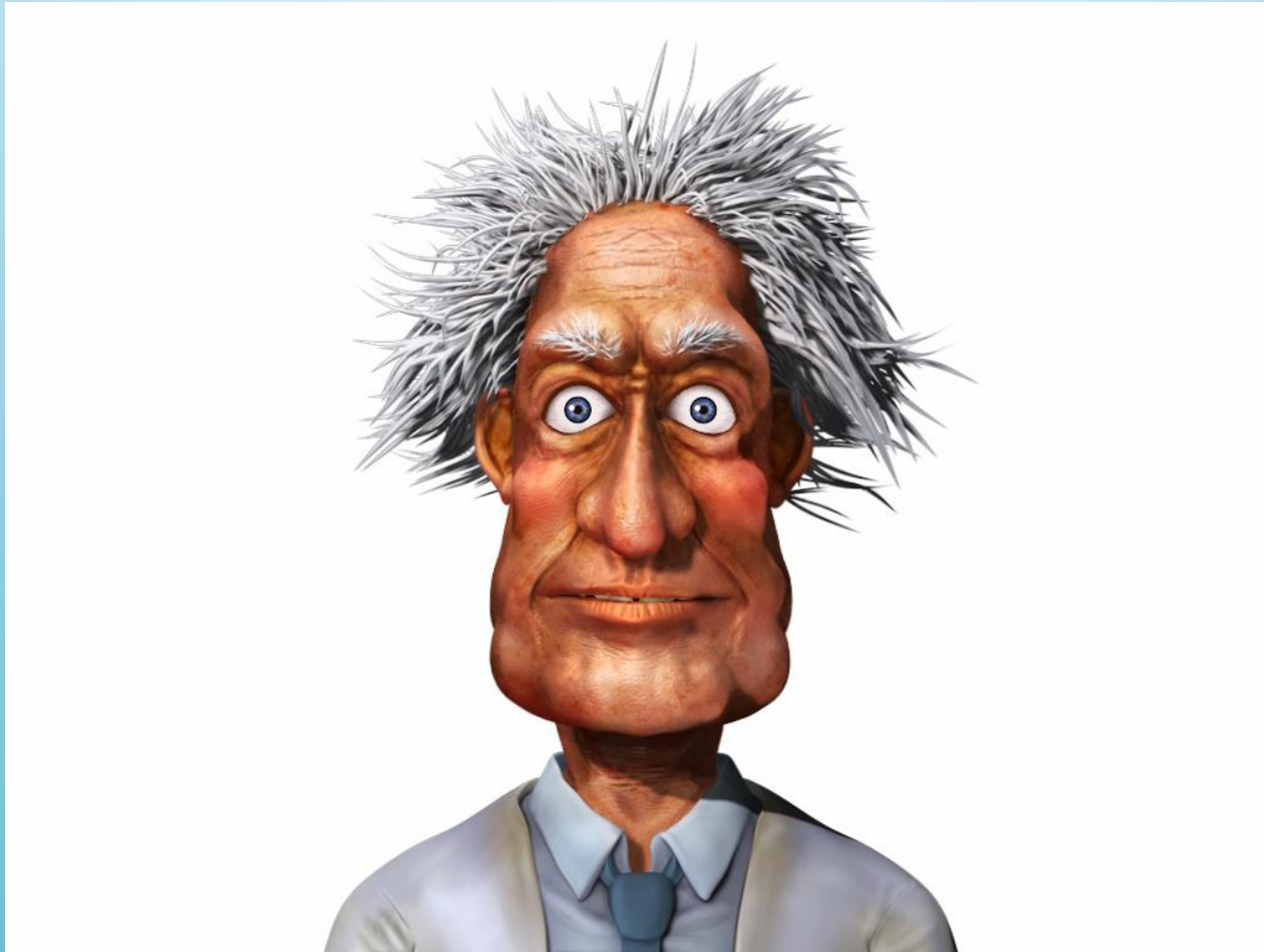
<sup>1</sup>Freeland, 1989 <sup>2</sup>Parvizi et al, 1998

# SCAPHOID FRACTURES

## IMAGING



# IMAGING



# Imaging

- Dexterity is vital in our everyday lives, so threshold for imaging hand / wrist injuries is low
- There are no validated decision making tools for wrist / scaphoid

# Imaging

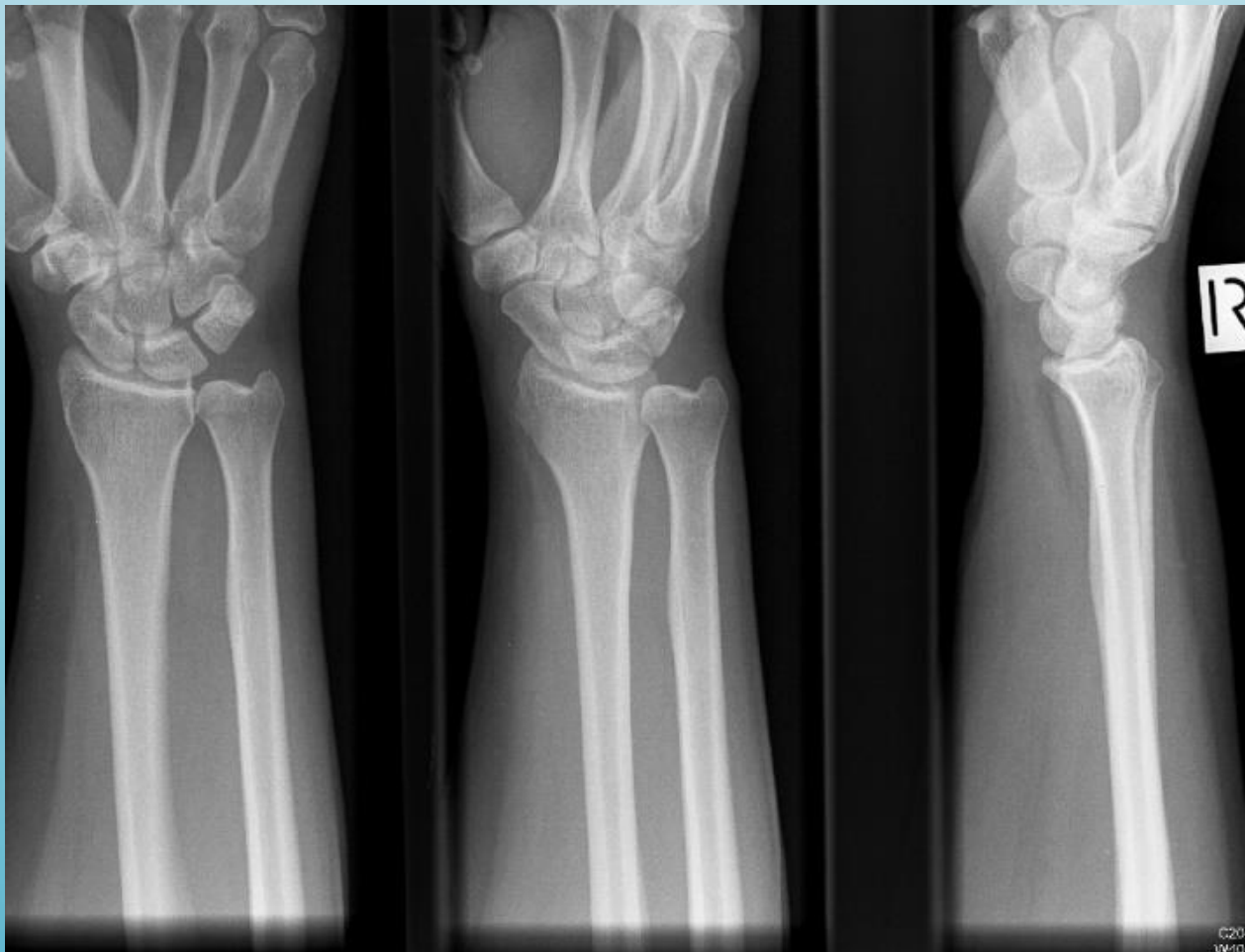
- Due to irregular shape and multiple articulations, imperative that appropriate views are taken
- Standard wrist PA and lateral x-rays miss 10-20% of these fractures
- Dedicated scaphoid views are recommended

(Perron et al, 2001)

(Cheung et al, 2006)

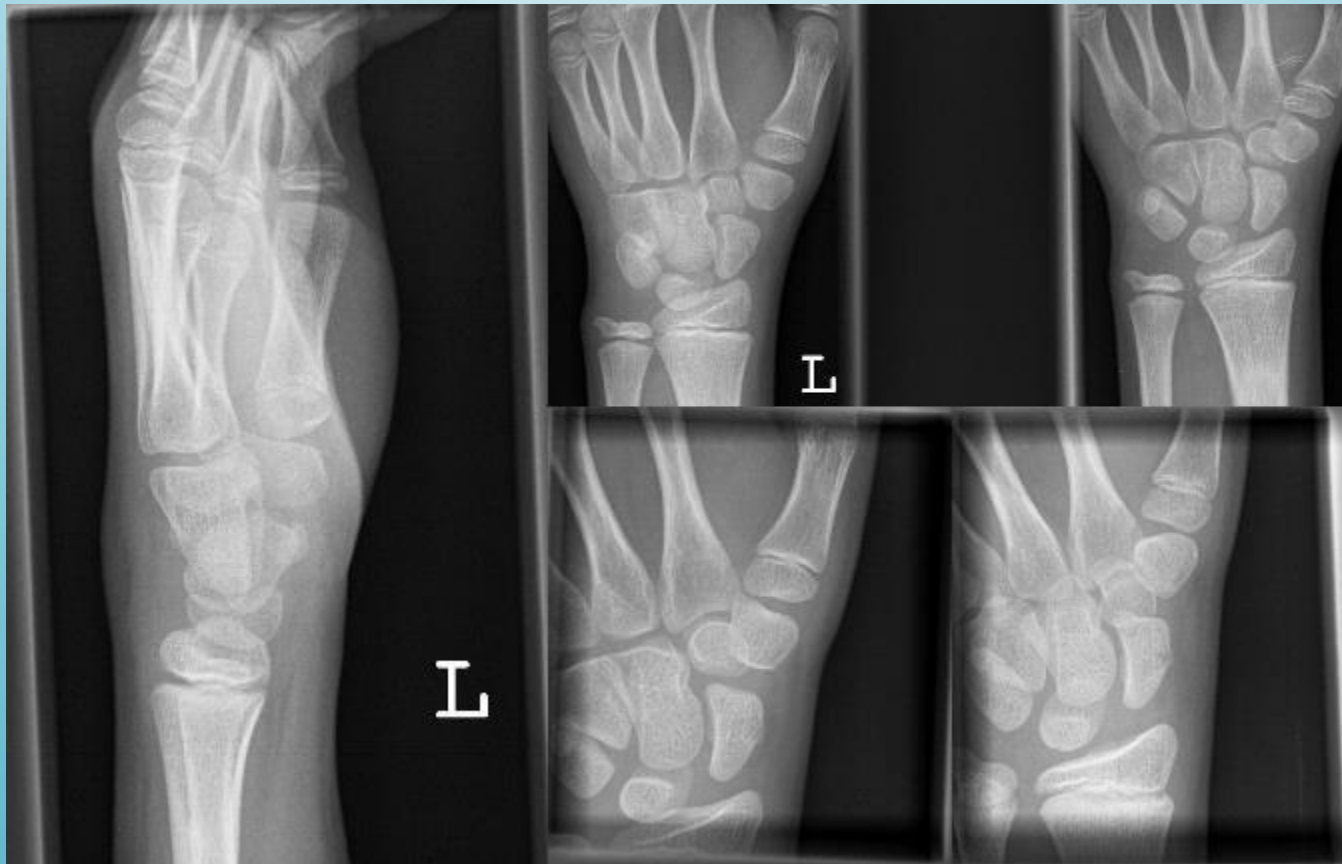
# Scaphoid Fractures

- Wrist X-rays (PA, lateral +/- oblique)



# Scaphoid Fractures

- Wrist X-rays (scaphoid series)







# SCAPHOID FRACTURES



# Imaging

- 7-20% of scaphoid fractures may not be visible on initial plain radiographs, even with dedicated views

(Ring, 2008; Hunter as cited by Stevenson et al, 2011; Gaebler as cited by Beeres et al, 2006)

- Non union rate increases to 30% if inadequately immobilised

(Furunes, Langhoff, Sjolín all cited by Rhemrev et al, 2011)

# Initial Management

- In Australasia, typical management for a suspected scaphoid fracture is a scaphoid splint or cast and:
  - reviewed clinically in 7-14 days (approx. 70%) and referred for repeat radiographs if clinically indicated
- OR
- early secondary imaging such as CT-Scan, bone scintigraphy or MRI

(Kelly, 2010)



# SCAPHOID FRACTURES



# Review

- Stevenson et al (2011) found that in a study of 84 patients with normal initial x-rays but suspicion of scaphoid fracture:
  - 7% actually had scaphoid #s (other studies = 20%)
  - 23% had other #s
    - 18% of other carpals
    - 5% of distal radius

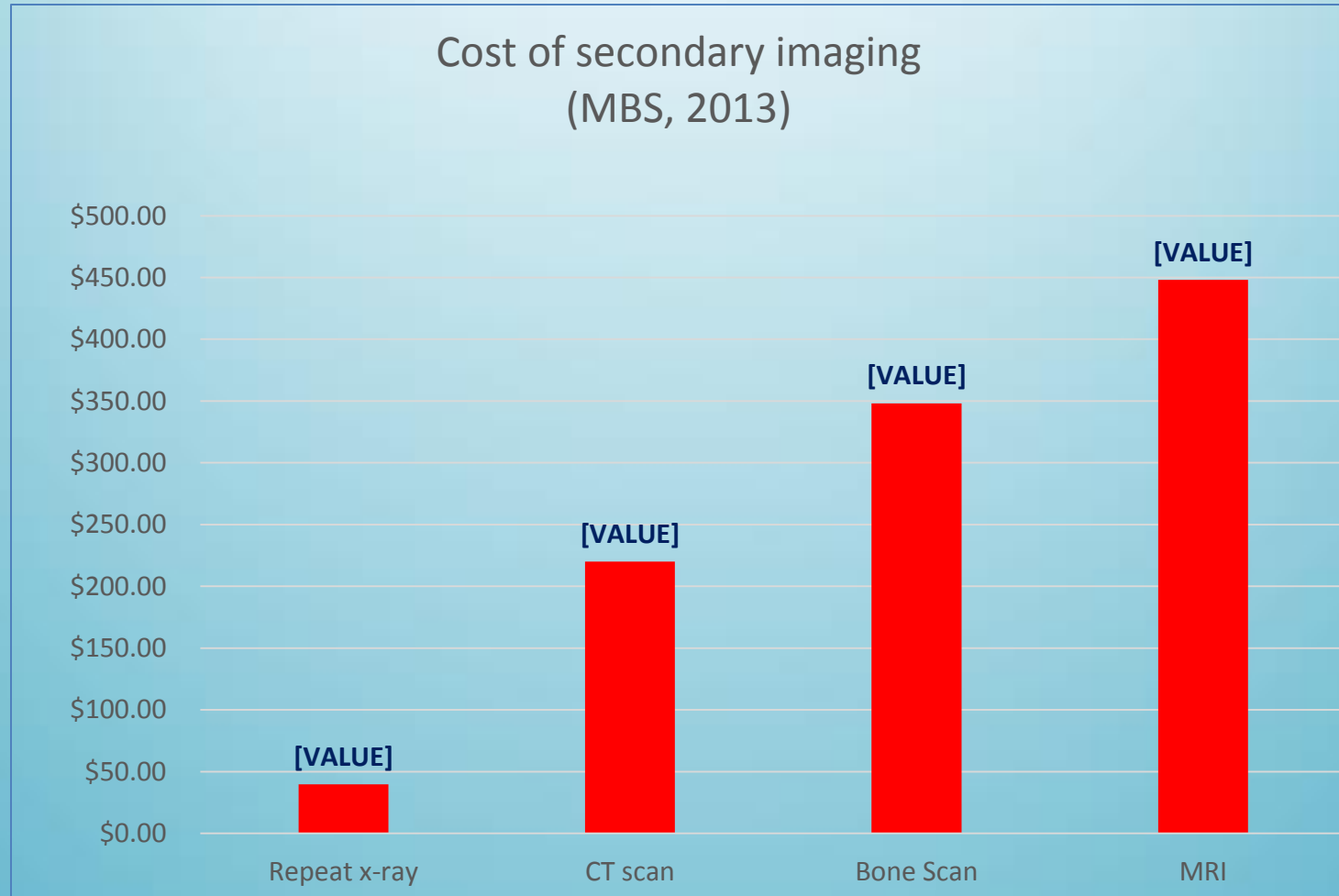
# Review

- No gold standard to compare to in research
- Most studies use plain films at 6 weeks as reference point, BUT up to 7% of #s NOT visible on plain films at 6/52

(Mallee et al, 2011; Yin et al, 2012)

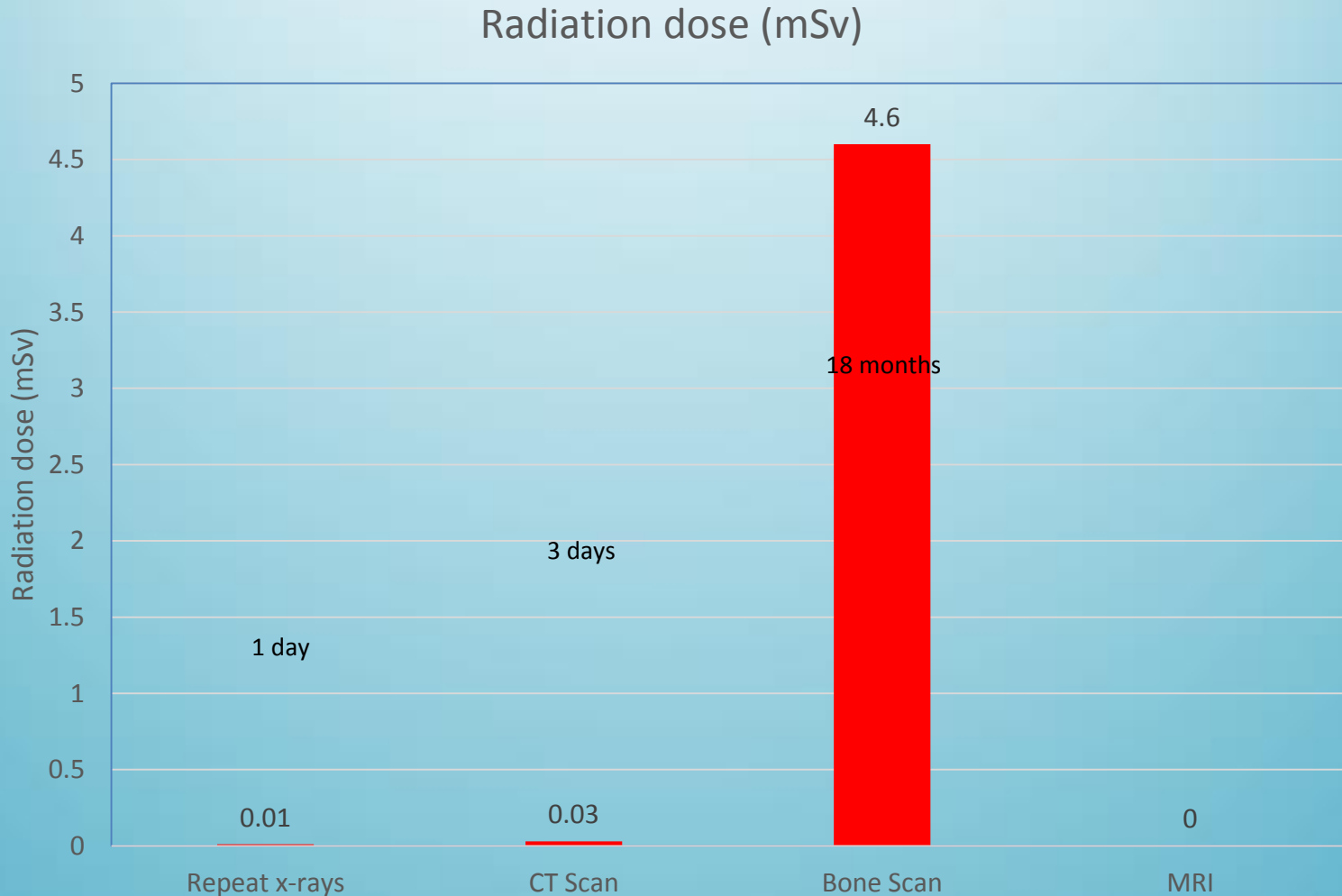


# Review



MRI requires specialist referral for MBS rebate (unless patient under 16), otherwise all other modalities can be referred by a GP.

# Review



(Rhemrev as cited by Stevenson et al, 2011; Cruickshank as cited by Stevenson et al, 2011)

# Review

Modality	Sensitivity	Specificity	Comments
Followup Radiographs	91.1%	99.8%	
CT Scan	85.2%	99.5%	Difficulty in distinguishing between vascular channels / trabecular patterns and #
Bone Scintigraphy	97.8%	93.5%	<ul style="list-style-type: none"><li>• Invasive procedure</li><li>• Takes 2-3 hours</li><li>• Difficult distinguishing between #, bone bruise, soft tissue injury and adjacent joint / bony injury</li></ul>
Magnetic Resonance Imaging	97.7%	99.8%	Bone marrow oedema - ? Bone bruising or # ??

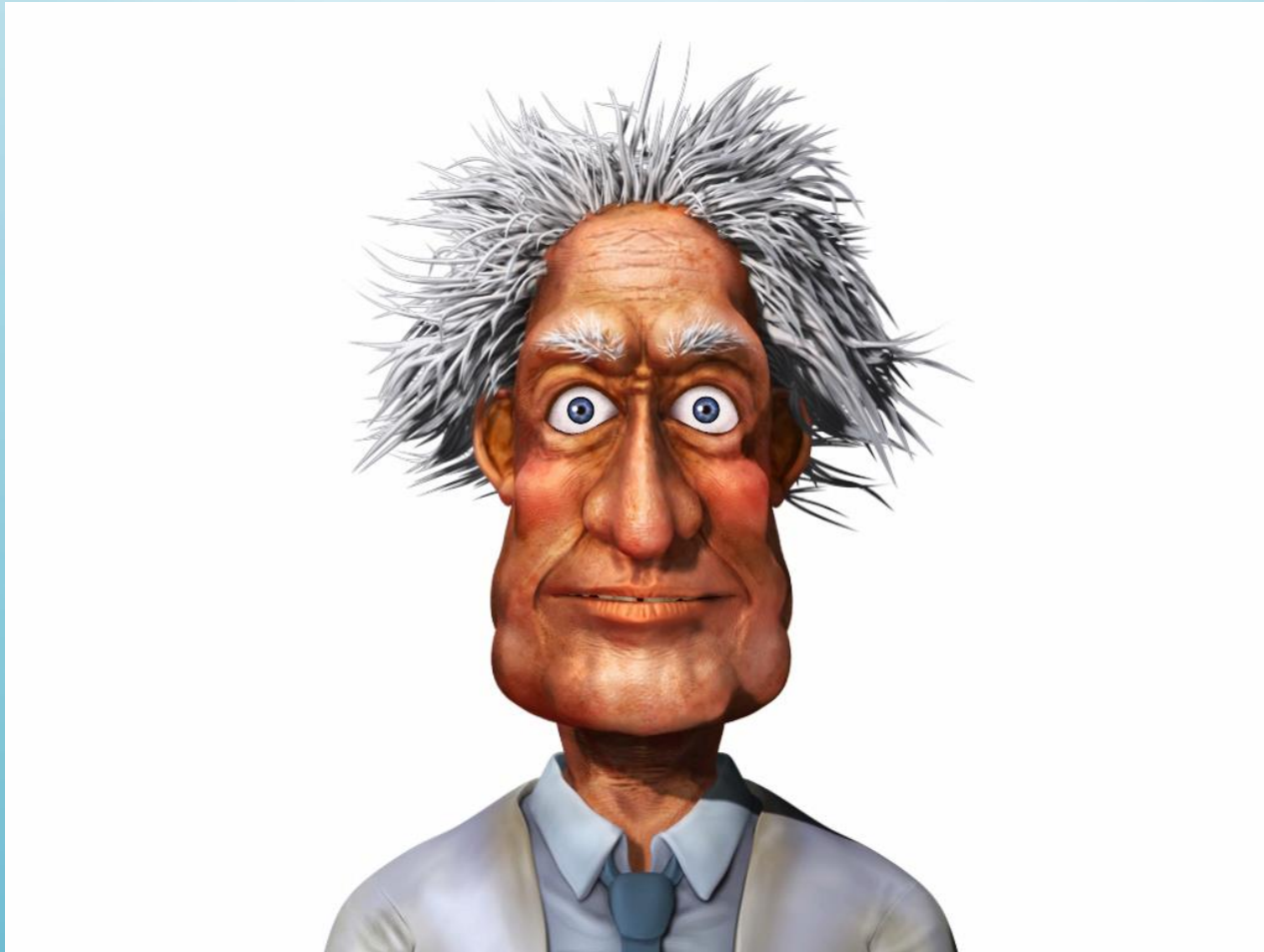
(Yin et al, 2012)

# SCAPHOID FRACTURES

## MANAGEMENT



# SCAPHOID FRACTURES



# Management

- Unsure when and why scaphoid cast became correct treatment

(Clay et al, 1991)

- To immobilise the thumb or not to immobilise the thumb – that is the question!



# Management



VS



- Round 1 (Cadaver model)
  - Wrist immobilisation crucial (no cast = # moved)
  - Inclusion of the thumb made NO difference
  - BUT 100% non-union
- Round 2
  - Clay et al (1991) found NO difference in union rate or function
- Round 3
  - Significant difference favouring immobilisation the wrist EXCLUDING the thumb (? why)
  - Well moulded and fitting cast may be more important than whether the thumb is included or not
- Does the position of the wrist affect healing??

(Schramm et al, 2008)

(Buijze et al, 2014)





# SCAPHOID FRACTURES



# Cast Duration

- Most scaphoid fractures are managed in a cast for 6-12 weeks
- Some ready at 4 weeks
  - Geoghegan et al (2009) found that 86% of patients had radiographic union on CT at 4 weeks
  - Of those patients who then had their casts removed, there were no adverse events
  - Remaining patients took up to 4 weeks to unite
- Most united within 12 weeks
  - All patients with undisplaced fractures of the waist were united within 12 weeks
  - Only 67% of those with **displaced** fractures were united

(Bhat et al 2004, as cited by Geoghegan et al, 2009)

- Cast time = until is it healed!
  - Evidence of callus bridging on imaging
  - Absence of fracture site tenderness

(McRae and Esser 5<sup>th</sup> ed., 2008)

# SCAPHOID FRACTURES

## CASE STUDIES

# Case Studies

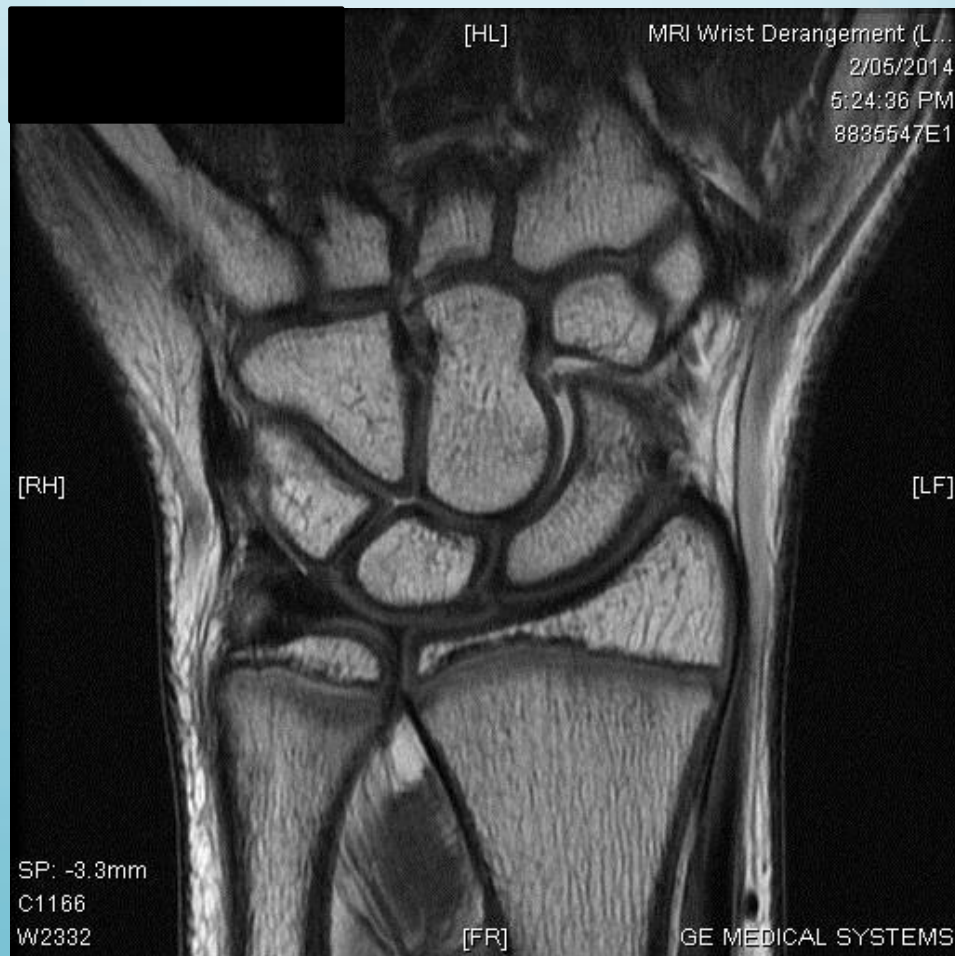
- 13 year old boy
- FOOSH from pushbike



- X-rays initially within 12 hours = NAD
- Managed in scaphoid cast
- Follow-up x-rays at 16 days = NAD but still suspicious of further injury
- MRI taken at 4 weeks

# Case Studies

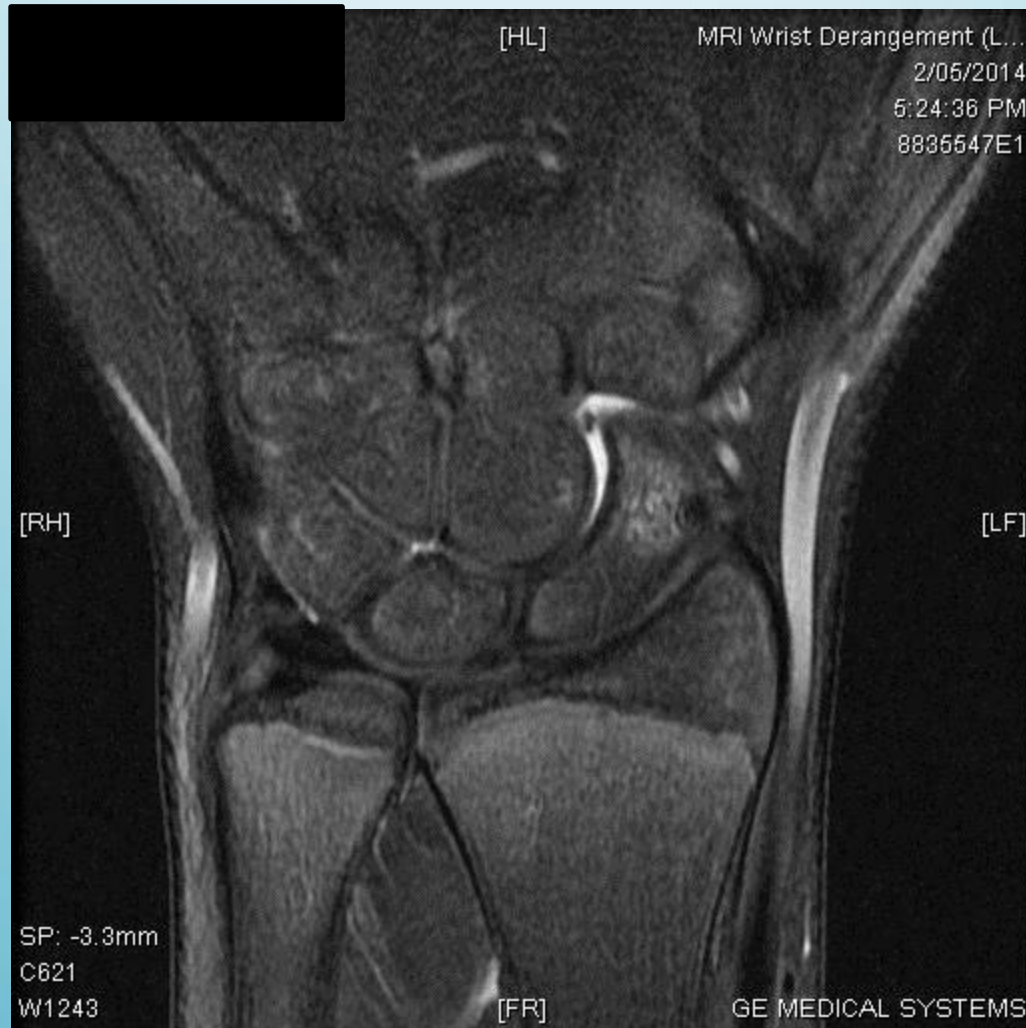
Cortical bone is black.



PD

# Case Studies

Oedema is  
bright white.

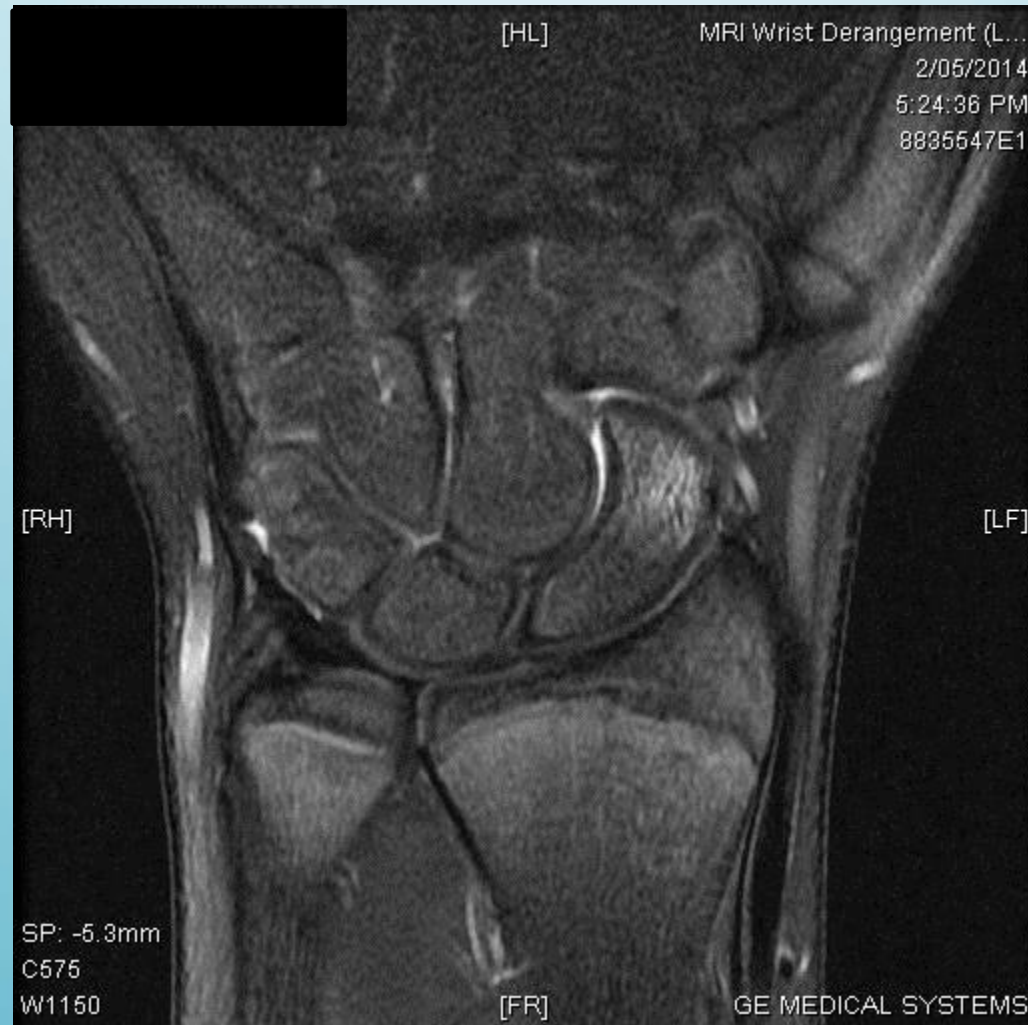


T2 Fat Sat



# Case Studies

Oedema is  
bright white.



T2 Fat Sat



# Case Studies

- Pt continued to have wrist pain, clicking
- Making the bed the night before ED presentation (4/12 later) and wrist clicked again
- Had persisting snuff box tenderness, pain on axial compression, loss of 50% of extension range and power

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# Case Studies





# QUESTIONS



# THANKS

