

# Acute scaphoid fractures and nonunions

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# Mechanism

Fall onto hand

**75%**

Violent twisting injury

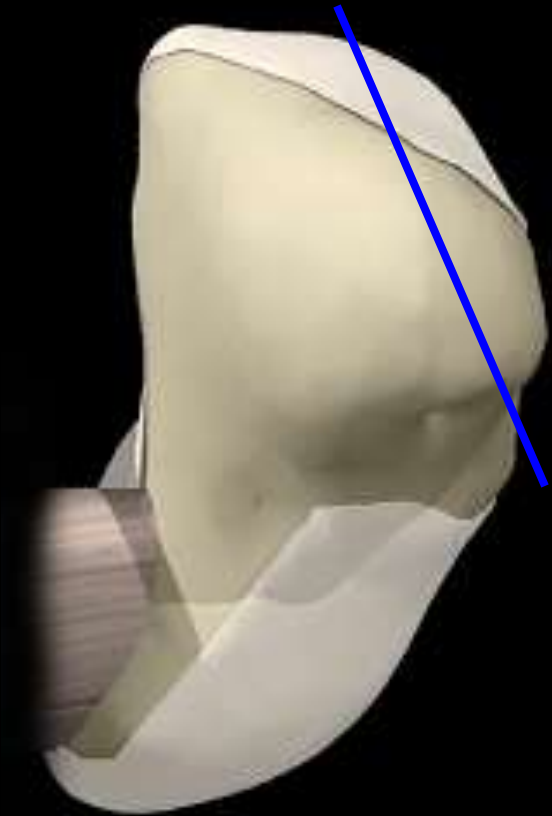
**15%**

# Mechanism

Commonest wrist injury in the working man

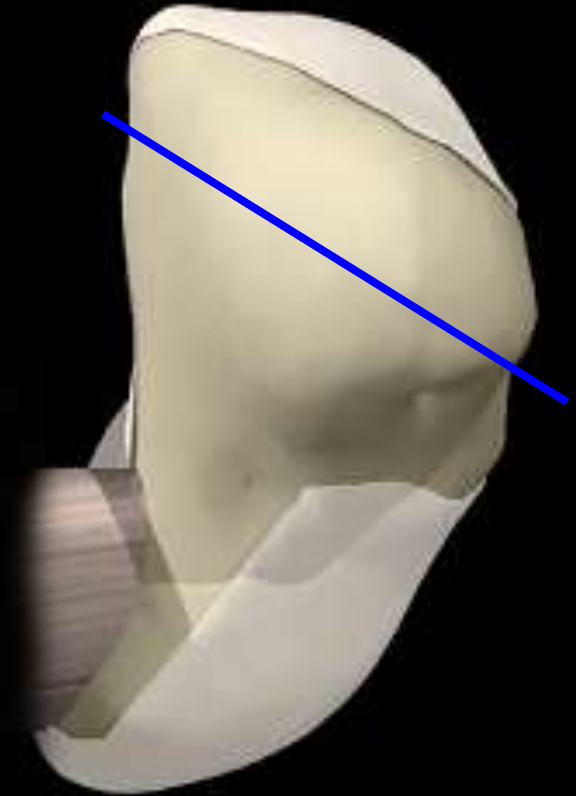
# Site

- Tuberosity 10%
- Distal third 11%
- Waist 72%
- Proximal pole 7%



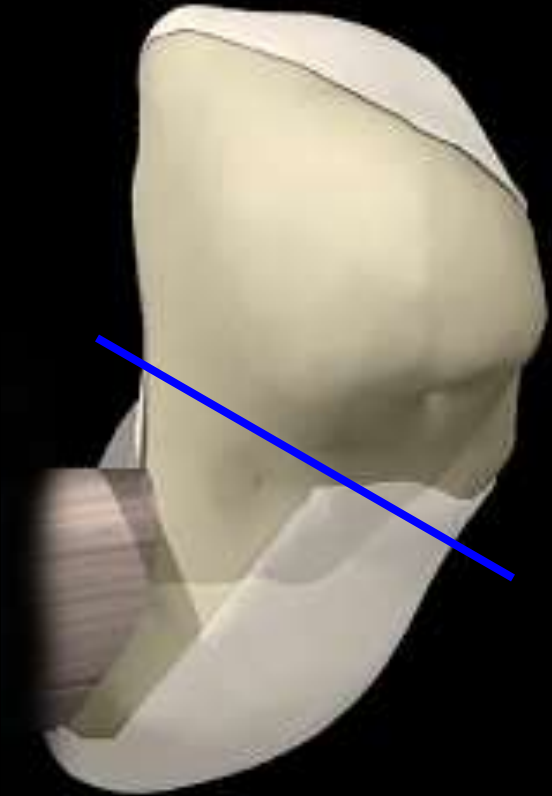
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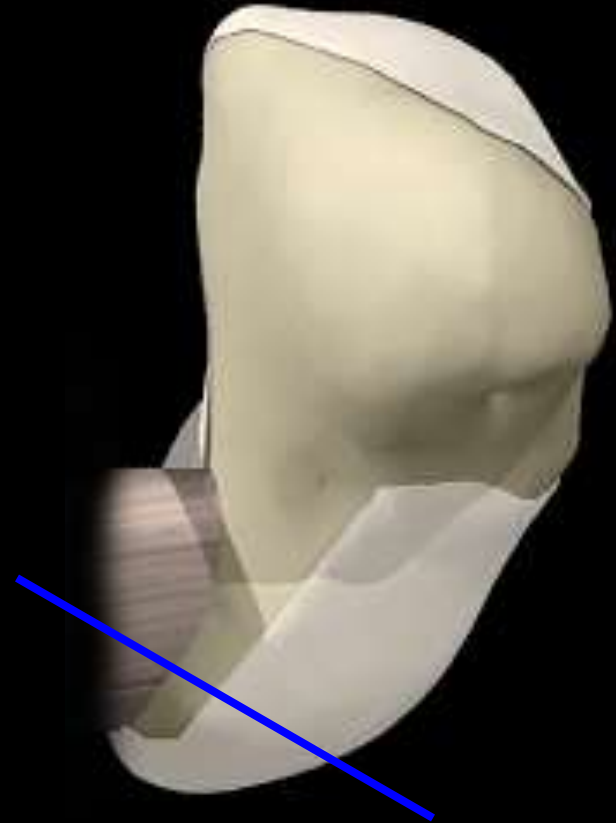
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# Mechanics

- Ulnar deviation
- Loading
- PP trapped  
between capitate &  
radius



# Mechanics

- Fall
- Twist whilst gripping

# Scaphoid Fractures

- Tuberosity 10%
- Distal third 11%
- Waist 72%
- Proximal pole 7%

Mechanism dictates injury pattern

# Blood supply

- Tubercle ligaments  
(20 - 30%)
- Dorsal surface ligaments  
(70 - 80%)

*1/3 people have no arterial  
foramina in the proximal half  
of the bone*

# Diagnosis

- History
- Pain
- Tenderness
- X-ray

# Diagnosis

- ASB Tenderness
- Axial thumb compression
- Loss of range of motion
- Painful grip

**No reliable signs**

*Waizenegger et al 1994*

# Diagnosis

Radiographs + Clinical suspicion

# Diagnosis

AP

Lateral

Will spot at  
least 95% of  
fractures

45° oblique

Long axis

(Extension & ulnar deviation)

# Diagnosis

PA ulnar deviated

113 scaphoid fractures

*Cheung et al 2006*

Pronated oblique

2 most reliable views



# Diagnosis

Early diagnostic means are often  
**unreliable**

If suspicion persists further  
examination is necessary at  
around **2 weeks**

# Diagnosis

Radioisotope – sensitive but not specific

# Diagnosis

CT scan – reliable at *negative* diagnosis

*Adey et al JHS 2007*

# Diagnosis

MRI – 95% sensitive and specific

Also gives prognostic information on vascularity

*Imaeda et al 1992, Sakuma et al 1995*

# Behaviour

- Relates to **vascularity**

'The issue of vascularity in fractures and non unions of the scaphoid'

**Buchler and Nagy 1995**

JHS (Br); 20B: 726-735

# Vascularity

**Distal** - Lateral Palmar Group  
Group (70-80%)

- Dorsal  
- Distal Palmar Group

# Vascularity

## Variability

Proximal to waist

0 = 13%

1 = 20%

>2 = 67%

Obletz & Halbstein 1938

Proximal to waist

27%

At the waist

59%

Distal to waist

14%

Gelberman & Menon 1980

# Vascularity

Travaglini (1959) Via SLIL

Gelberman & Menon  
(1980)  
Deep RSL

Kuhlmann & Guerin-Surville  
(1981) only in 40%

Kauer (1993)  
confirmed this



# Vascularity

- Distal to proximal
- Variable pattern
- 2 distinct regions
- 80% enters on the dorsal ridge
- Tenuous proximal to waist
- More proximal = more tenuous
- Transient avascularity after # is the norm

# Vascularity

- Proximal pole supply variable and unreliable
- Proximal pole fractures lead to vascular disruption
- Lack of periosteum deprives bone of blood flow
- Many other factors contribute to avascularity

to

# Vascularity

## Assessment

- Plain x-rays are not reliable  
*Downing et al 2002*
- MRI
- Direct inspection

67% non unions fail to unite  
(Farnell, Jeys & Campbell BSSH 2002)

# Scaphoid fractures

- > 85% undisplaced fractures will heal
- Average healing time 9-10 weeks
- Immobilisation time varies with site
- Many different types of cast

*Leslie & Dickson 1981*

# When has union occurred?

Xrays are unreliable

# When has union occurred?

- 1 Satisfactory appearances
- 2 Impending union
- 3 Impending non union
- 4 Unsatisfactory appearance

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# Avascularity

The 'dense' proximal pole  
on x-ray is NOT a sign of  
avascularity

MRI is reliable

# Risks of non union

- Fracture site
- Fracture displacement
- Delay in treatment
- Fracture collapse

# Humpback deformity

# Management

- 'Special fracture'
- Dictated by vascularity threat
- No consensus view

# Nonoperative

- (Prolonged) period in cast
- Include thumb?
- Long or short?

*Gellman et al 1989*

- Add Pulsed em stimulation?

*Frykman et al 1986*

# Operative

- Open/Percutaneous
- Dorsal approach
- Cannulated screw
- Mini C-arm
- ?Graft if comminuted

*Trumble & Vo 2001*

# Percutaneous fixation

- Undisplaced waist fractures
- Proximal pole fractures
- No cast required
- Allows early movement
- Few long term differences



# Percutaneous fixation

- 4 - 5 mm scar
- Regional anaesthetic
- Fluoroscopy control
- No cast

# Percutaneous fixation

- 100% union
- 80 - 90% ROM at 8 weeks
- 75% grip strength

# ORIF

- Displaced acute fractures
- Trans scaphoid PLI
- Notable non union risk

# Personal View

## Proximal pole fractures

### Undisplaced

Offered short arm cast

8 – 10 weeks

Offered percutaneous fixation

Short arm cast 2 weeks

Splint 4 weeks

### Displaced

ORIF strongly recommended +/- primary graft

Short arm cast 6-8 weeks

# Outcome

- Assessment of union unreliable with plain x-rays
- Signs of 'non-union' are clear
- Signs of 'union' are not

This leads to difficulty in stating **when** a fracture has united

# Summary

- Good outcome... if treated
- Be suspicious
- Investigate early
- Offer aggressive treatment
- If it's a non union, say it's a non union