

Distal Radius and Associated injuries PAOS 2019

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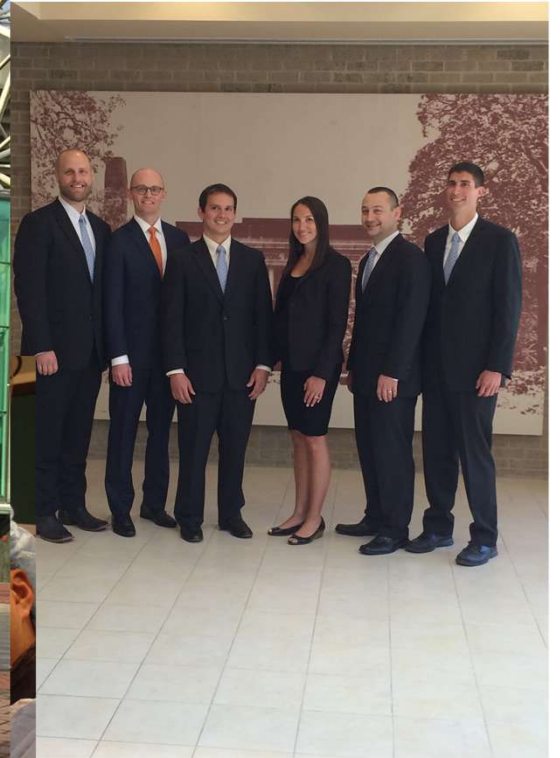


UT Health
San Antonio

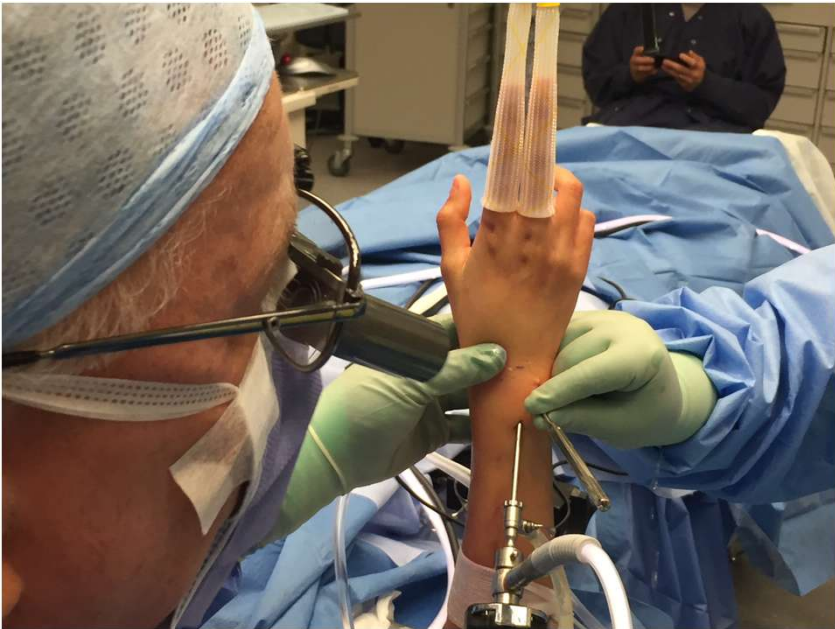
Learning Objectives

1. Discuss the anatomy of the hand and wrist
2. Discuss fractures of the hand and wrist
3. Open Forum and Questions





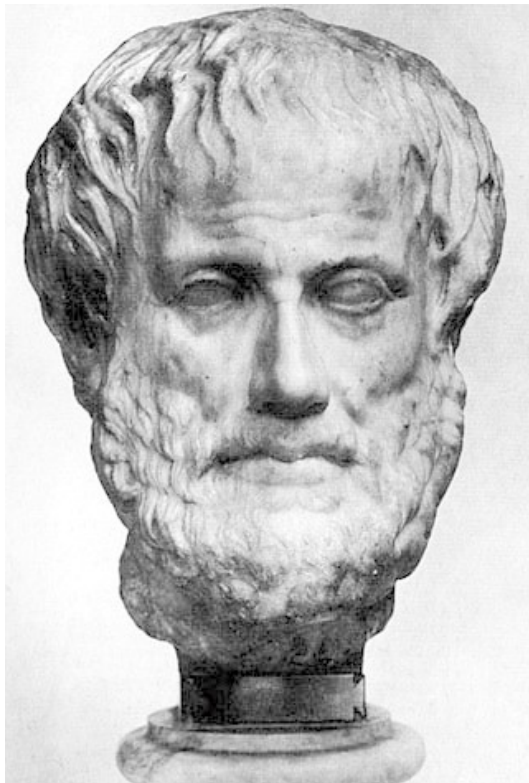








The Hand



“...instrument of instruments.”

“...for the body as the intellect is for the soul.”

Aristotle

Anatomy

Distal radial morphology

Thin cortical shell

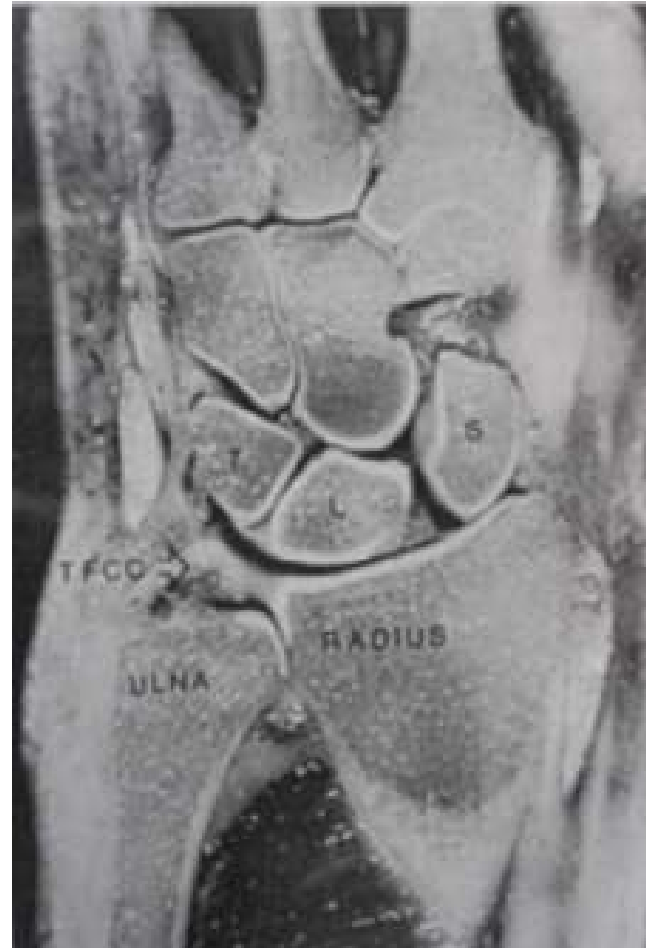
Thicker subchondral bone

Dense cancellous bone

- Ulnar greater than radial

Age-related changes

- Cortical thinning
- Loss of cancellous bone
- Density



Anatomy

Angular alignment

Radial inclination

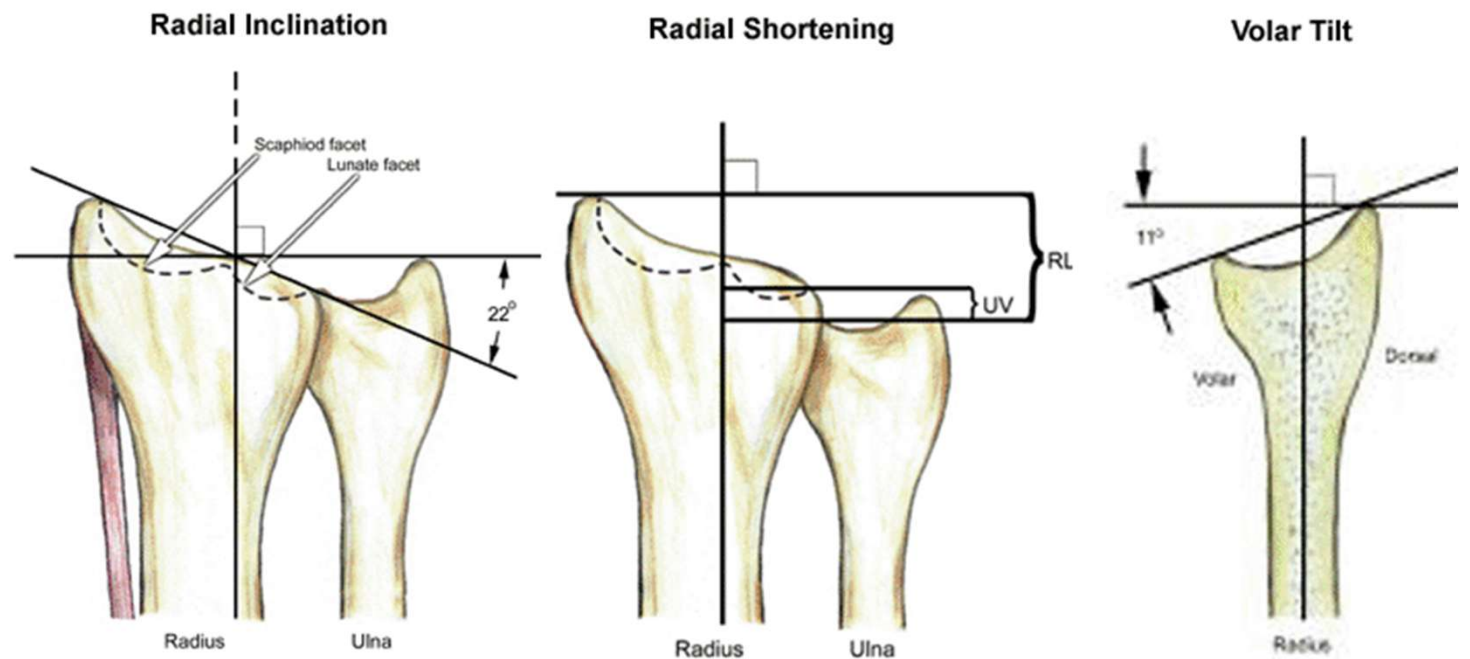
22 degrees

Volar tilt

11 degrees

Radial length

+/- 2 mm



Demographics

Incidence

~15% of all extremity fractures
640,000/year US
Most common upper extremity fracture

Age range

Low energy fractures

More common

Two peak age ranges

6-12 years

> 60 years (female predominance)

Pathologic/osteopenia

High energy fractures

Young adults (MVA)

Working males (fall from height)

Specific Treatment Recommendations

Non-displaced fractures

Early active range of motion at 4 weeks

- Reliable patient

Wean/discontinue immobilization after 6 weeks

Occupational therapy occasionally necessary

Risk of EPL rupture

- Rare
- Occurs late (beyond 6 weeks)

Specific Treatment Recommendations

Displaced fractures

Attempt closed reduction

- Hematoma block
- +/- IV sedation

Initial splint or cast

- **Plaster** or fiberglass
- **Long arm** or short arm
- Position of rotation: arguments for pronation, **neutral** and supination exist

Specific Treatment Recommendations

Displaced fractures

- Post reduction radiographs (AP/ 20° lat)

Acceptable

- Encourage range of motion of digits and shoulder
- Ice and elevation
- Follow up at 1 and 2 weeks
- Radiographs through cast @ wks. 1 & 2
- at 2 weeks out of cast and change (to short arm) cast

Specific Treatment Recommendations

Displaced fractures

- Remains acceptable
- Follow up at 6 weeks
- Remove cast, evaluate need for therapy
- 6 months to maximum range of motion and strength
- Up to 1 year maximum subjective improvement
- Loss of reduction identified at 0, 1, 2, or 3 weeks
- Operative treatment
- Re-reduction in first one to two weeks

Predicting Fracture Instability

Lafontaine M, et al., Injury, 1989

Dorsal angulation > 20 degrees

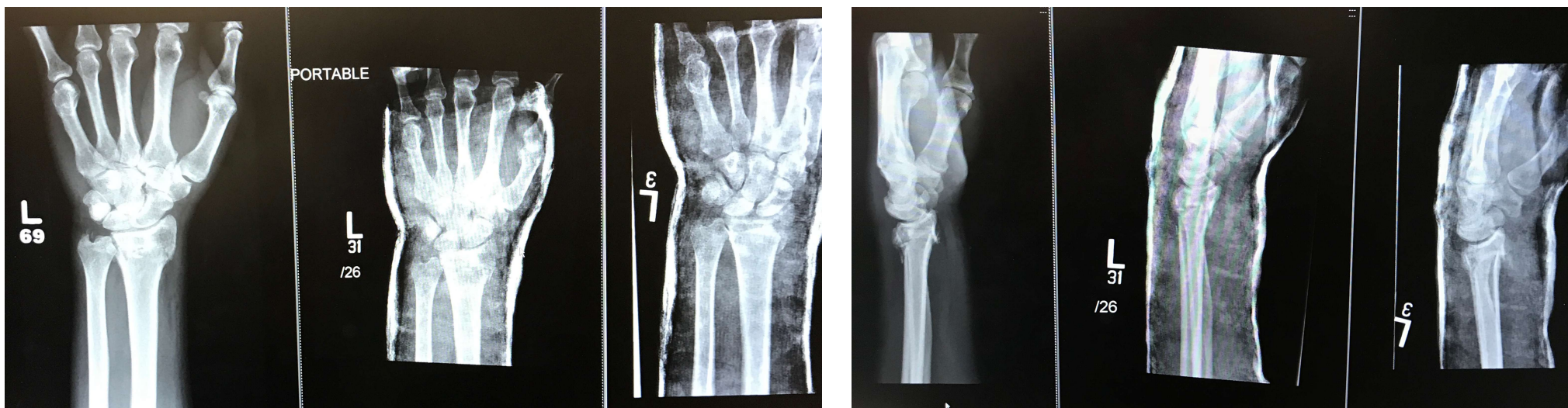
Dorsal comminution

Intra-articular radiocarpal fracture

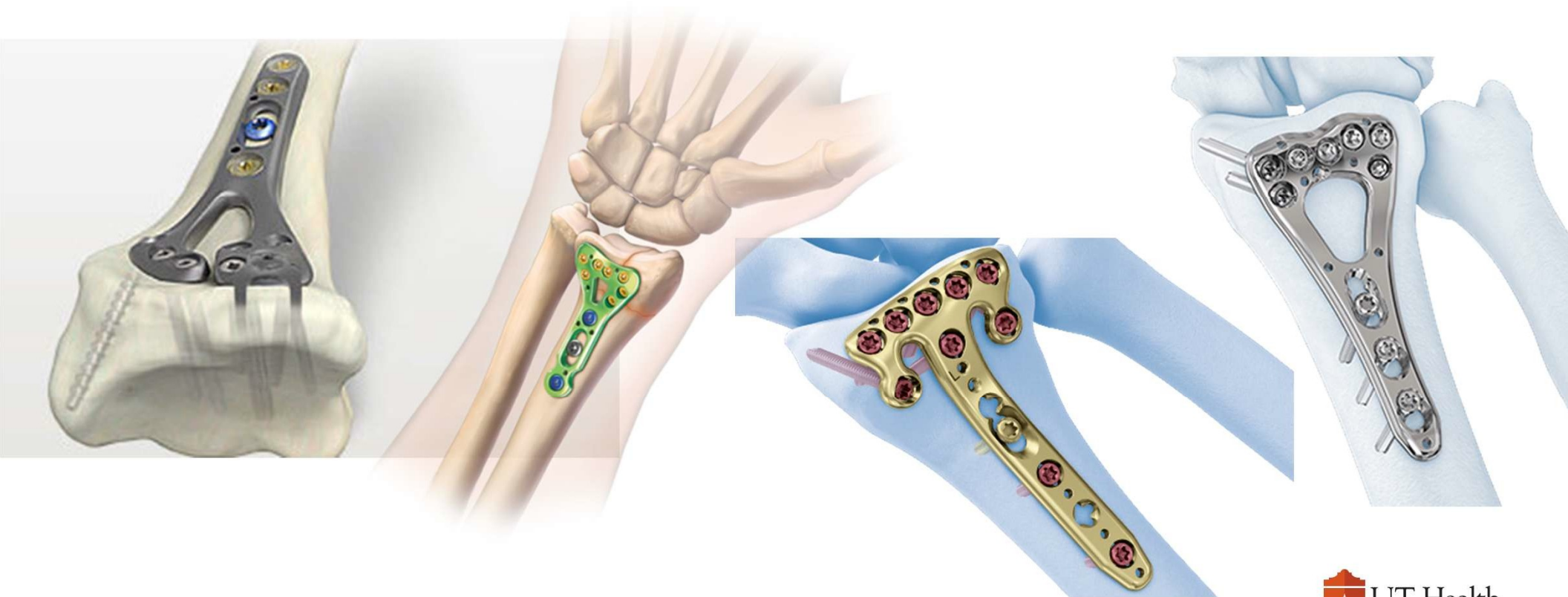
Ulnar fracture

Age older than 60

Example



Volar Locking Plates



Recent Literature

Nonop vs ORIF for Elderly Extra-articular

- 140 randomized
- Same complication rate
- Better PRWE, DASH and grip strength with surgery

Nonoperative Treatment Compared with Volar Locking Plate Fixation for Dorsally Displaced Distal Radial Fractures in the Elderly

A Randomized Controlled Trial

Jenny Saving, MD, Sara Severin Wahlgren, MD, Kristin Olsson, MD, Anders Enocson, MD, Sari Ponzer, MD, Olof Sköldenberg, MD, Maria Wilcke, MD, PhD, and Cecilia Mellstrand Navarro, MD, PhD

Plaster vs ORIF in Extraarticular all ages

- 90 Randomized
- 42% in nonop became op
- Better DASH, PRWE, SF-36, ROM
- More complications in nonop

Volar Plate Fixation Versus Plaster Immobilization in Acceptably Reduced Extra-Articular Distal Radial Fractures

A Multicenter Randomized Controlled Trial

Mulders, Marjolein A.M., MD, PhD¹; Walenkamp, Monique M.J., MD, PhD¹; van Dieren, Susan, PhD¹; Goslings, J. Carel, MD, PhD²; Schep, Niels W.L., MD, PhD³; ; on behalf of the VIPER Trial Collaborators

Bottom Line

- Followup 1,2,4 weeks
- Refer more often to surgeon, based on newest literature

Associated Injuries

Minimal Research

We know hand fractures and carpal fractures are common

How often? How Much?

Active research

Associated Injuries

Ulnar Styloid Fractures

- Ulnar styloid, ulnar head and ulnar shaft
 - 58% of distal radius

Ulnar Styloid Fractures Associated With Distal Radius Fractures: Incidence and Implications for Distal Radioulnar Joint Instability

Megan M. May, BS, *Lexington, KY*, Jeffrey N. Lawton, MD, *Cleveland, OH*, Philip E. Blazar, MD, *Boston, MA*

Wrist Soft Tissues

- TFCC 53% of Extra-articular
 - 35% of Intra-articular
- SL Ligament 31% of Intra-articular
 - 6.7% of Extra-articular

Arthroscopic Diagnosis of Intra-articular Soft Tissue Injuries Associated With Distal Radial Fractures

Robert S. Richards, MD, FRCSC, John D. Bennett, MD, CML, FRCPC,
James H. Roth, MD, FRCSC, FACS,
Ken Milne Jr, MD, London, Ontario, Canada

Associated Injuries

Ulnar Styloid Fractures



Wrist Soft Tissues



The Fingers



“The reputation of a surgeon may stand as much in jeopardy from this injury (phalangeal fx) as from any fracture of the femur”

Finger Fractures

Most frequent of all skeletal injuries

Outer rays of hand most frequently injured

Most commonly young males (10-40 years)

Although non-union not common ...

Malunion, tendon adhesions, joint stiffness, not uncommon

Enormous cost

Finger Fractures

Until early 1900s all treated non-operatively



Phalangeal Fractures

Distal phalanx.....45%

Middle Phalanx.....5.7%

Proximal phalanx.....17.3%

Metacarpal.....32%

Borgeskov Acta Chir Scand '67

Distal Tuft Fractures

Usually crush injury

Often nailbed/pulp injury

Subungual hematoma

Nail edges intact: trephinate

Nail edges disrupted: explore

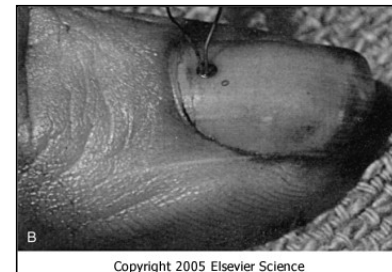
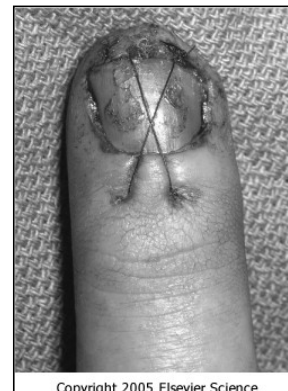
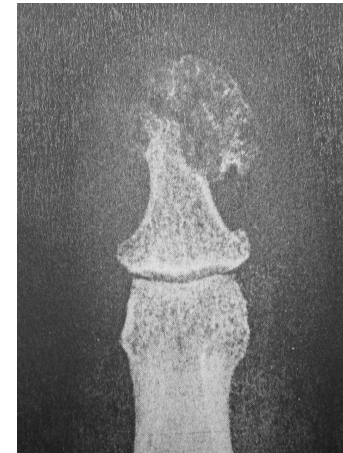
Repair nail bed injury

Loupes, 7-0 chromic

Replace nail

Antibiotics

Short immobilization



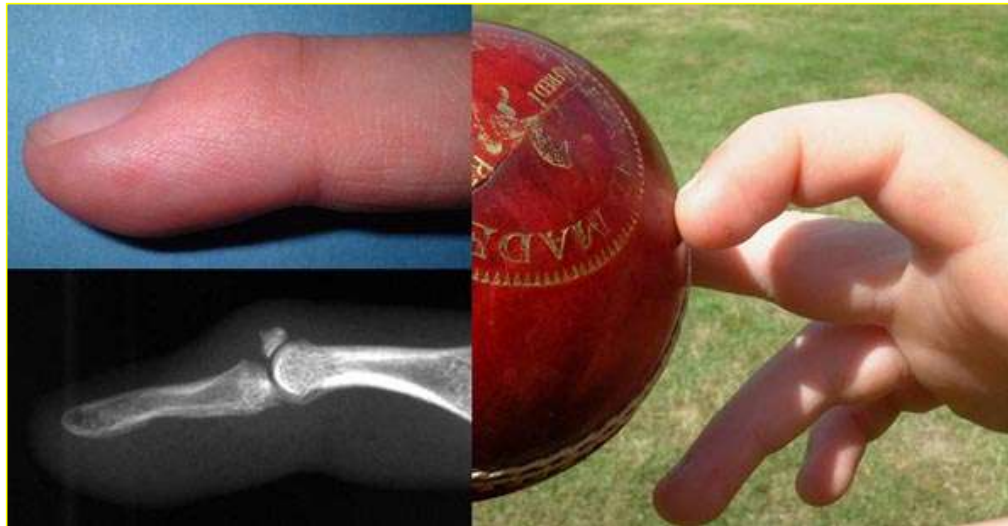
Mallet Fractures

Common sports injuries

Active DIP extension w/ sudden forced flexion

Soft tissue mallet finger (75%)

Mallet fracture (25%)



Mallet Fractures

Undisplaced: splinting

6-8 weeks full-time

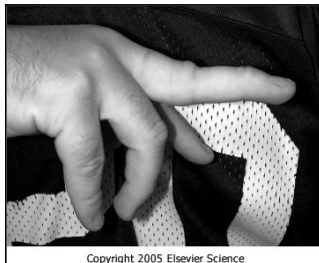
2-6 weeks night-time

Most reports: success in 80%

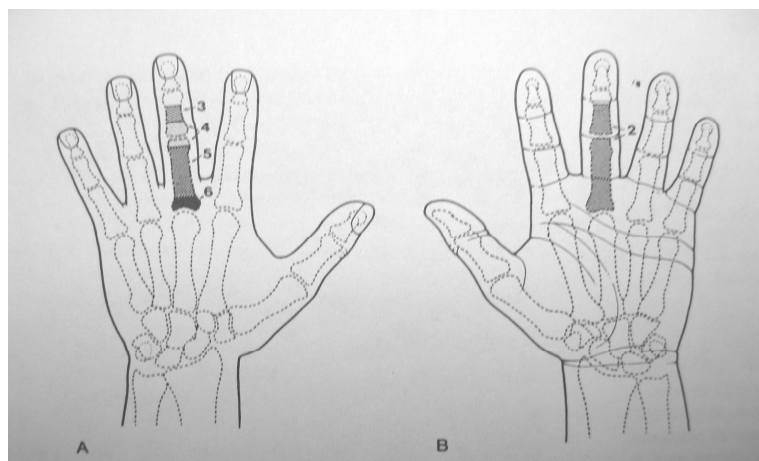
Beware skin breakdown!

Can splint several months after injury

Only DIP splinted



Middle & Proximal Phalanges



“No person’s zone”
of finger fractures

Factors affecting post-injury digital performance

Patient factors

Injury factors

Management factors

Middle & Proximal Phalanges

“A finger injured in this way may be so crippled that even if the skin wound could be closed and the fracture reduced, the final result would be a healed fracture surrounded by a stiff, insensitive cylinder of skin.”

Adrian Flatt

Middle & Proximal Phalanges

Immobilization of joints

Most authors advocate < 3 weeks immobilization

Strickland et al Orthop Review '82

No difference in digital function for fx's immobilized < 4 weeks

Return of function: 75-80% of normal

Significant decrease in digital function if immobilized > 4 weeks

Return of function: < 66% of normal

Barton JBJS '84

> 3 weeks: 60% of patients w/ significant loss of hand function

Middle & Proximal Phalanges

Nonarticular

Neck

Shaft

Articular

Condylar

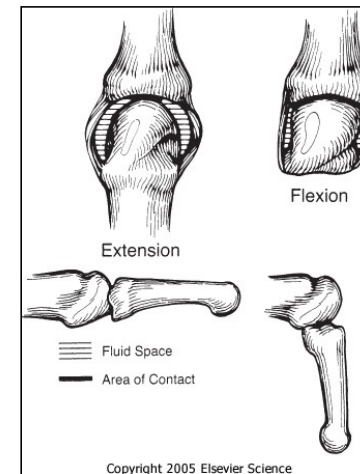
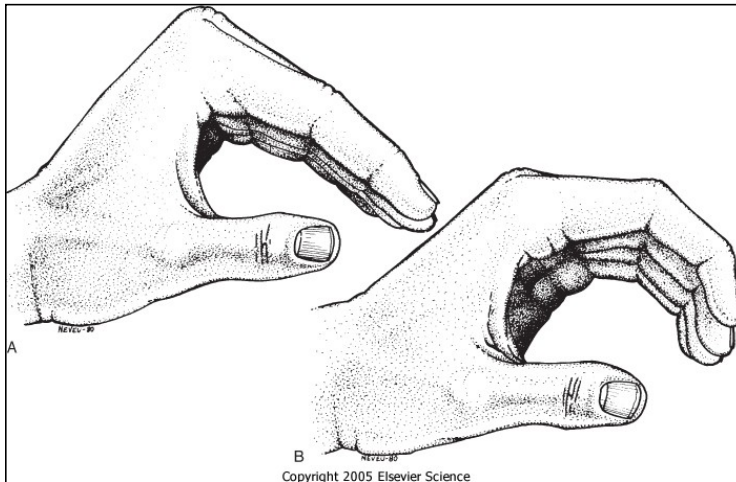
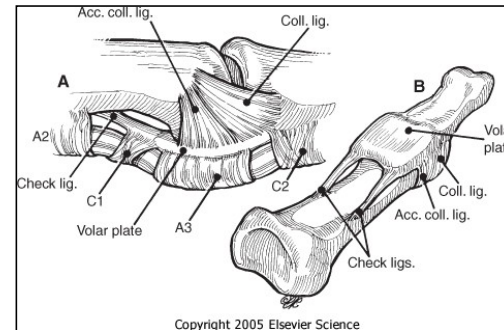
Base

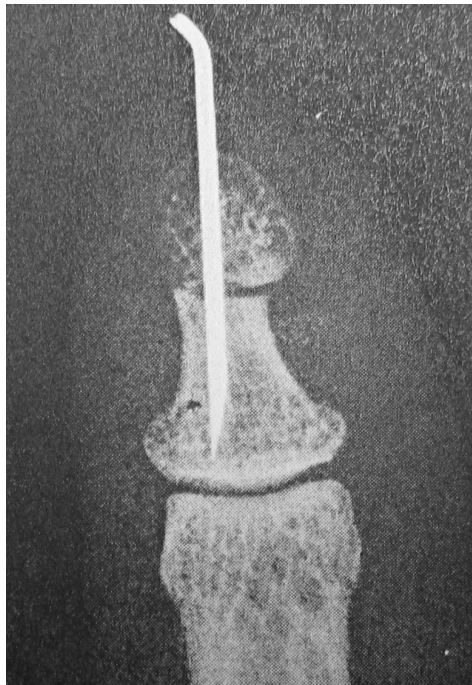
Physeal



Shaft

Stable fractures
Buddy taping
Splinting





Metacarpal Anatomy

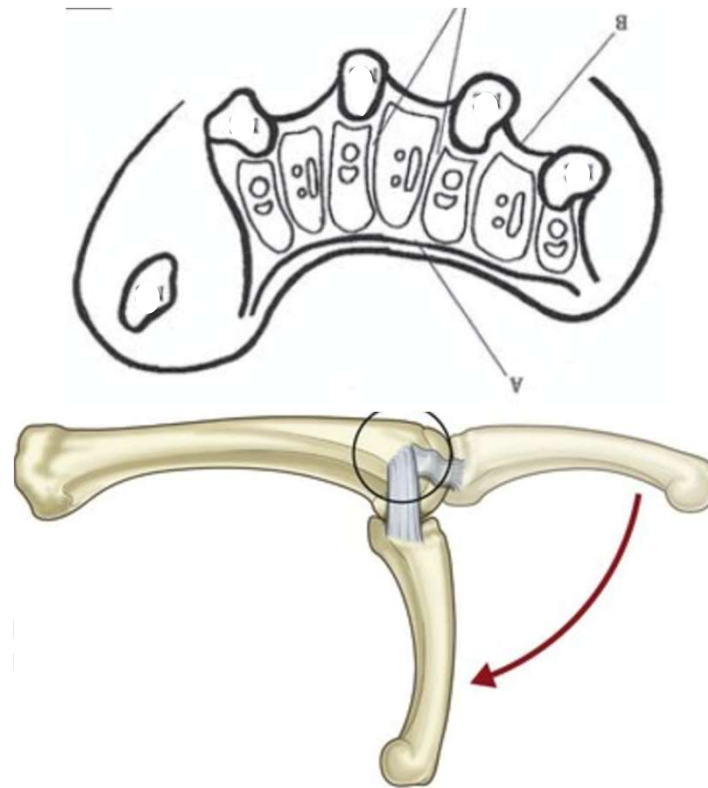
Concave volarly

Form longitudinal and transverse arches of the palm

MC head forms condylar joint with the proximal phalanx

MC head is cam shaped

Collaterals more lax in extension



Classification

Descriptive pattern

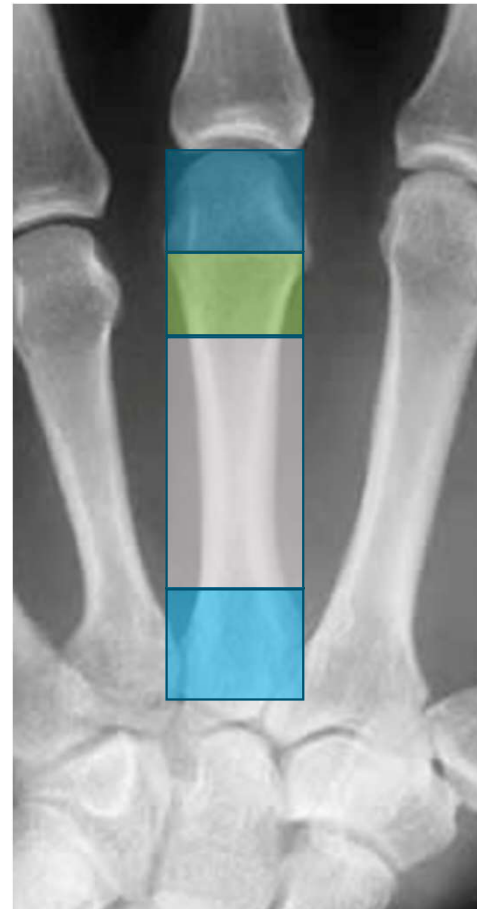
similar to other long bone fractures

open vs closed

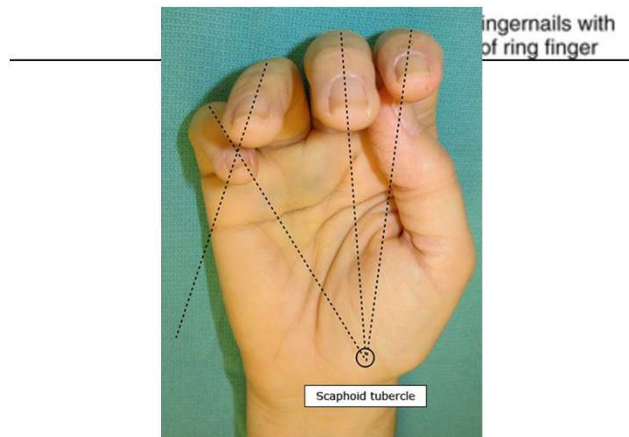
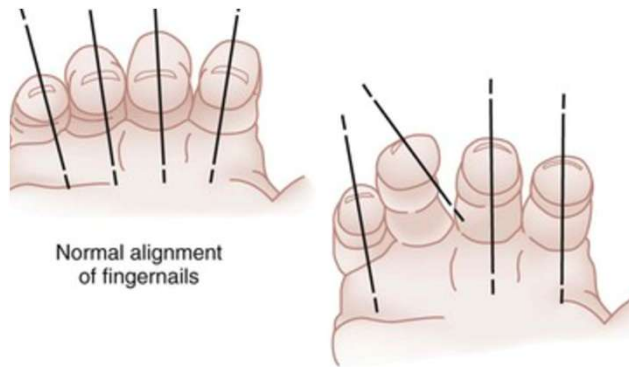
intra vs extra-articular

oblique, transverse, spiral
or comminuted fracture
patterns

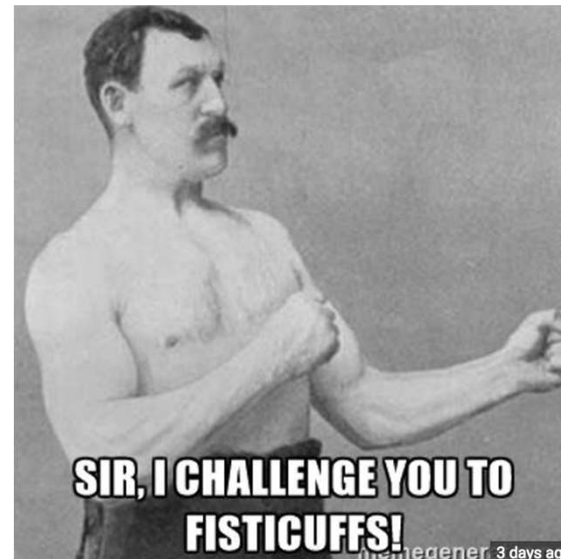
By anatomic location



Presentation



“The usual etiologies are a direct blow during fisticuffs, or a fall”



Indications

Any rotational malalignment

1° of MC rotation can lead to 5° of tip rotation

5° can lead to 1.5cm of finger overlap

“Unstable” fracture patterns

Multiple metacarpal fractures

	Acceptable Shaft Angulation (degrees)
Index & Long Finger	10-20
Ring Finger	30
Little Finger	40


	Acceptable Shaft Shortening (mm)
Index & Long Finger	2-5
Ring Finger	2-5
Little Finger	2-5

	Acceptable neck Angulation
Index & Long Finger	10-15
Ring Finger	30-40
Little Finger	50-60

Nonoperative Management

Do we need immobilization?

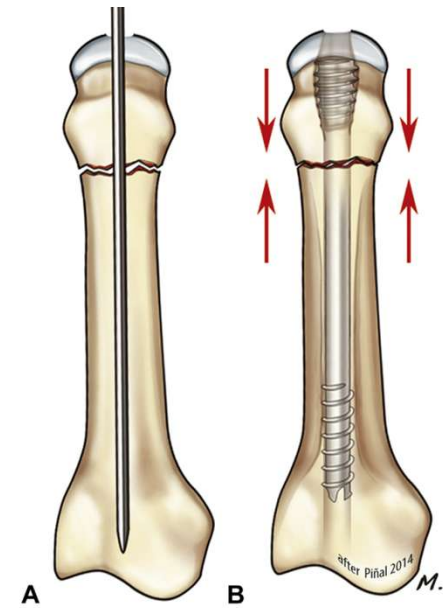
Fifth metacarpal neck fractures treated with soft wrap/buddy taping compared to reduction and casting: results of a prospective, multicenter, randomized trial

Jan van Aaken¹  · Cesare Fusetti² · Stefano Luchina³ · Stefania Brunetti² ·
Jean-Yves Beaulieu¹ · Angèle Gayet-Ageron¹ · Kathryn Hanna⁴ · Alexander Y. Shin⁵ ·
Eric Hofmeister⁴

Arch Orthop Trauma Surg (2016) 136:135–142



Fixation



Bottom Line

- Rotation and overlap are key
- Less time and less immobilization

Incidence

	Number	Percentage
Scaphoid	2393	73.5%
Triquetrum	586	18%
Trapezium	94	2.9%
Hamate	76	2.3%
Pisiform	48	1.5%
Capitate	34	1.1%
Lunate	17	0.5%
Trapezoid	8	0.2%
Total	3256	100%

Teisen H, Hjarbaek J, J Hand Surg Br 1988

Scaphoid Anatomy

Five articular surfaces

Bridges proximal and distal carpal row

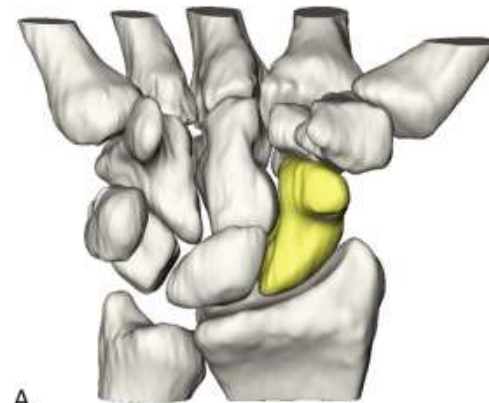
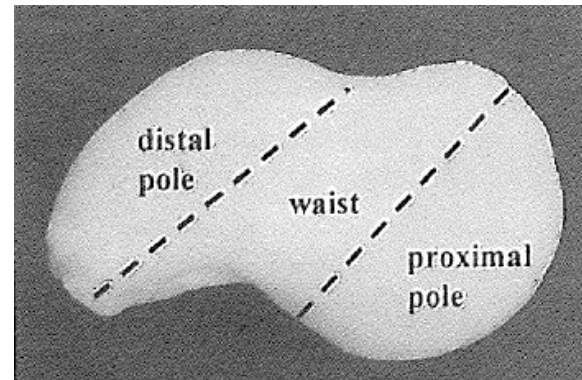
80% covered by cartilage

3 regions

Distal pole

Waist

Proximal pole



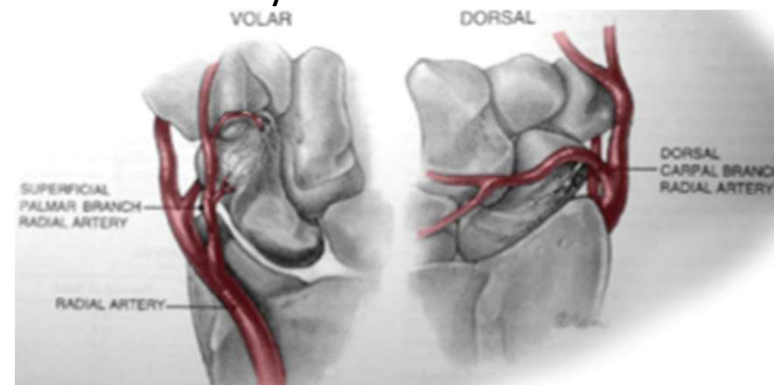
A

Blood Supply

Main blood supply: dorsal branch of the radial artery
Enters through dorsal ridge
~80% of blood supply
Supplies proximal portion by **retrograde blood flow**

Secondary blood supply: Superficial palmar branch of radial artery
20-30% blood supply
Supplies distal portion

Proximal pole: intramedullary flow



Scaphoid Fractures

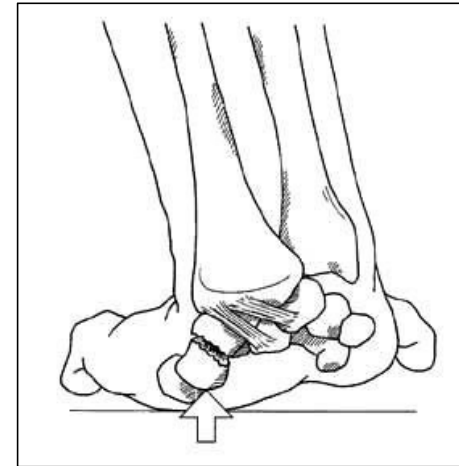
Fall on an outstretched hand
Dorsiflexed and radially

Men age 15 to 40

94 % low energy mechanism

Fall on an outstretched hand
Sporting accident

Adequate treatment: union rate ~ 95%



Classification- Location



Scaphoid
tubercle
fracture



Scaphoid
waist
fracture



Proximal
pole
fracture

Splint vs MRI

Option 1: Splint + repeat xrays in 10-14 days

Poor interobserver reliability

Option 2: Acute MRI

Sensitivity of 100%

Specificity of 95-100%

High interobserver reliability

Diagnose soft tissue injuries



Cost-Effectiveness of Immediate MR Imaging Versus Traditional Follow-Up for Revealing Radiographically Occult Scaphoid Fractures

Theodore A. Dorsay¹
Nancy M. Major
Clyde A. Helms

Wrist MRI: \$ 770

Follow up + remove splint/cast + repeat x-rays: \$ 677

Loss of productivity

Need for future MRI

Recommended obtaining immediate MRI



Cost-Effectiveness of Immediate MR Imaging Versus Traditional Follow-Up for Radiographically

Fractures

Theo
Nanc
Clyde



Wrist MRI: \$ 770

Follow up + remove spli
Loss of productivity
Need for future MF

Recommended obtainir



Unstable Fractures

Advocates operative treatment

> 1 mm displacement

Lateral intrascaphoid angle > 35

Bone loss or comminution

Perilunate fracture-dislocation

DISI

Proximal pole fractures

Smoking

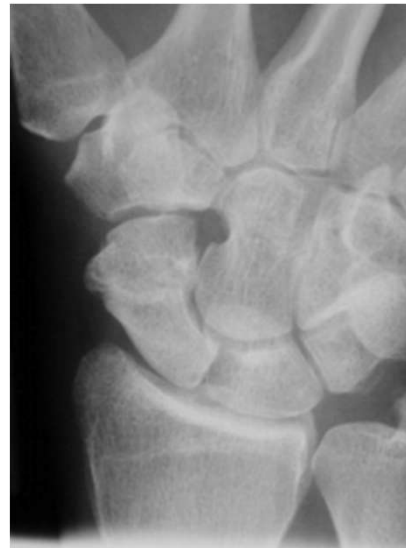


Surgical Management

6 months to prevent progressive carpal instability/ arthritis

Correct:

- Bone loss
- Carpal collapse
- Humpback
- Restore vascularity
- Promote union



Bottom Line

- If concerned investigate
- 95% heal without surgery with immobilization

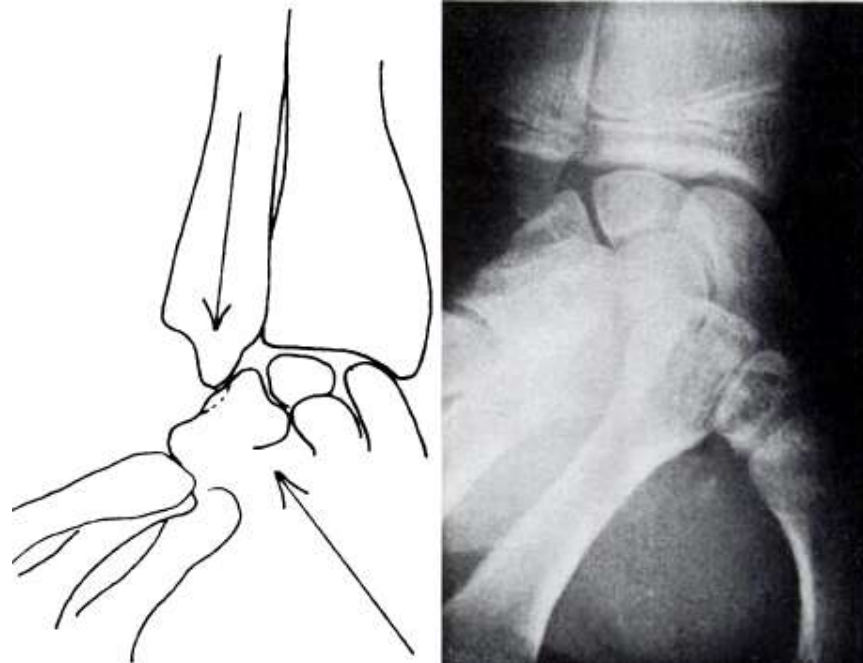
Triquetrum

- 2nd most common carpal fracture
- Types
- Dorsal chip
- Body (rare)



Triquetrum

- Mechanism
- Wrist extension
- Ulnar deviation
- Styloid impaction
 - Levy 1979
 - Garcia-Elias 1987



Levy M, et al. JBJS Br 1979

Imaging



Triquetrum


Treatment

Splint v.s. short arm cast
x 4-5 wks (small
fragment, nondisplaced)



Questions?

Thank You



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