

How I Manage Acute Scaphoid Fractures

Jeffrey Yao, MD

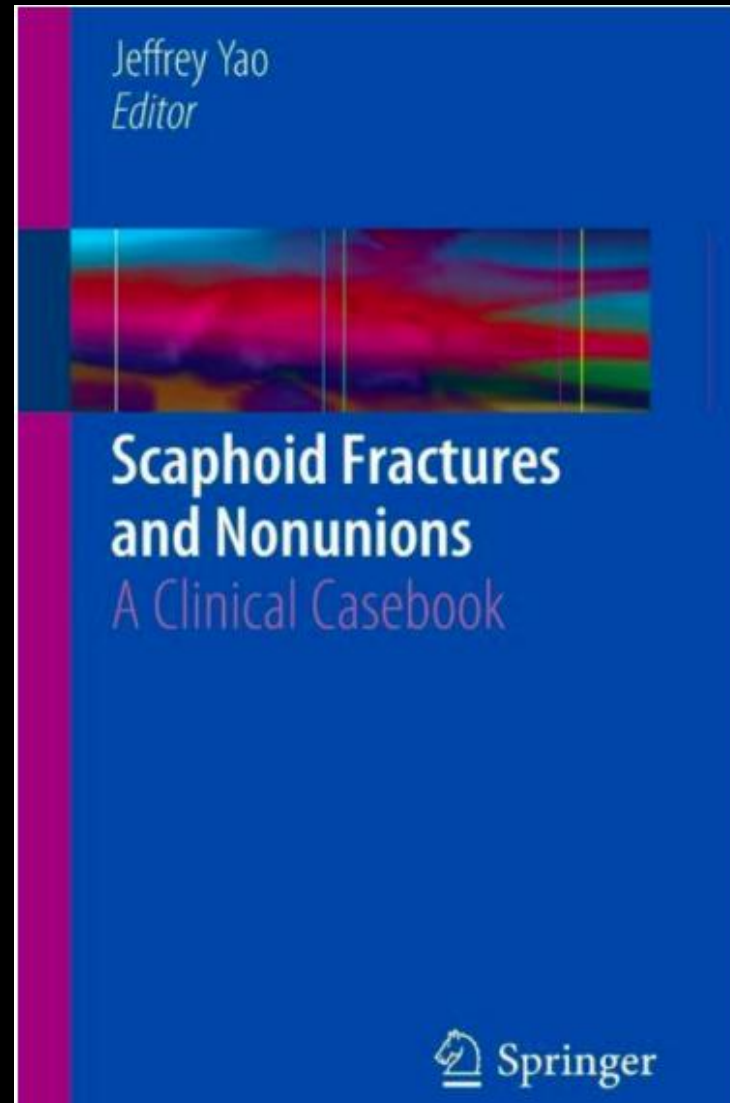
Associate Professor

Department of Orthopaedic Surgery

Stanford University Medical Center



Shameless Plug...



Scaphoid Fractures

- The classic controversies:
 - Cast versus surgery?
 - Cast: Long or short arm?
 - Cast: Include thumb or not?
 - Athletes?
 - Surgery: Volar versus dorsal approach?
 - Surgery: One screw? 2 screws? Plate and screws?



Epidemiology

- Most frequent in young adult males
 - 2nd/3rd decade
 - Most common: waist of the scaphoid
 - Requires twice the force needed to cause a distal radius fracture
 - Recent increase in females
 - Sports
- Rare in children
 - 0.34% of all patients less than 15 y/o
 - Increasing incidence (sports, BMI?)
 - Most common: distal pole of the scaphoid
 - Cast immobilization is standard; nonunion rare

Examination

- Wrist swelling
- Tender snuff box
- Tender dorsal scaphoid
- Tender scaphoid tubercle
- Pain with radial deviation
- Pain with pinch and pronation most predictive
 - Unay, Injury 2009
- Diagnosis confirmed by radiographic examination



Imaging

- Non-displaced fractures frequently missed on initial radiographs
- Scaphoid normally rests in 45° of flexion relative to the radius
- A fracture may not be visible if it rests in a plane oblique to beam of radiograph



Courtesy of Mark E. Baratz, MD

Scaphoid Oblique Radiograph

- Posteroanterior (PA) view with wrist in ulnar deviation and the beam angled 20° distal to proximal
- Will often show fractures not seen on PA or lateral view

“Occult” scaphoid fracture



Courtesy of Mark E. Baratz, MD

PA view

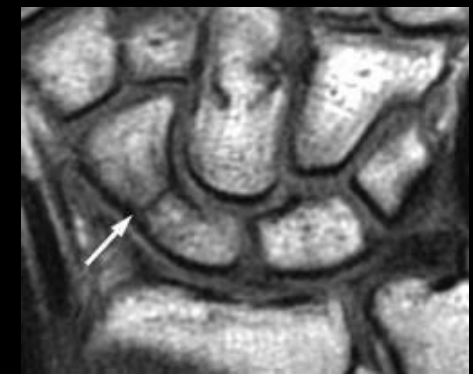
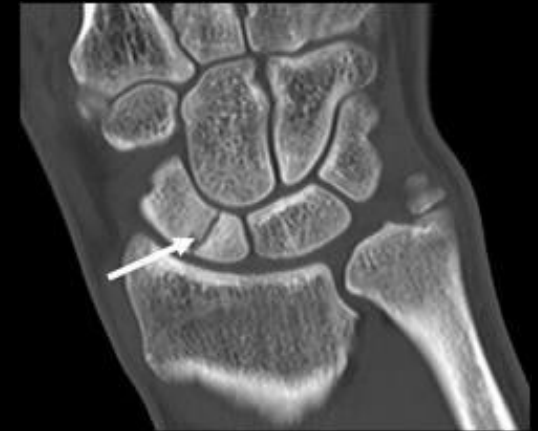
Scaphoid Oblique

- If initial films are unremarkable, the wrist should be immobilized and reexamined in 2-3 weeks
 - Thumb spica splint/cast
 - Repeat radiographs
 - Ultrasound
 - Tomogram
 - CT
 - MRI
 - Only 7% of suspected fractures are true fractures
 - Van Tessel, JHS 2010



Other imaging modalities

- Bone scan
 - Sensitive (96%), not specific (89%)
- CT scan
 - Take in plane of scaphoid
 - Sensitive, defines comminution and angulation of the fractured scaphoid
 - Excellent to assess healing
- MRI
 - Sensitive (98%), specific (99%)
 - Ring, et al (Arthroscopy, 2008)
 - defines vascularity of proximal pole



Treatment Options

- Cast Immobilization
- Surgery



Cast Immobilization

- Include the Elbow?
 - First suggested by Verdant in 1954
 - Eliminate the action of the volar radiocarpal ligaments on the scaphoid during supination and pronation
 - Gellman (JBJS, 1989)
 - significant reduction in time to healing when LAC was used
 - Dickson (JBJS, 1981)
 - 95% union rate in fractures treated with short arm, thumb spica cast
 - McAdams and Ladd (CORR, 2003)
 - minimal motion at the fracture site during rotation in a below-elbow cast



Consider long arm cast for 6 weeks followed by short arm cast until healed for:

- Patient
 - Smoker
 - Poor compliance
- Fracture
 - All proximal pole
 - Waist fracture “at risk”
 - Comminution
 - Oblique/vertical
 - Fracture displacement



Cast Immobilization

- Why include the thumb?
 - include the thumb in a position of opposition
 - Eliminates disruptive action from the APL, APB, EPL, EPB
 - Bohler, Herbert, Clay:
 - nonunion risk increased with below elbow casting and the thumb left free
 - Recent metanalysis suggests no difference
 - Doornberg et al (JOT 2011)



Duration of immobilization

- Distal pole: 4 weeks
- Waist fracture: 6 to 8 weeks
- Proximal pole: 6 weeks to ??? months (CT Scan)



Percutaneous fixation of scaphoid fractures versus casting

- Bond et al. JBJS 2001
 - Union rates (time to healing)
 - 7 weeks for surgery vs 12 weeks for cast
 - Return to work
 - 8 weeks vs 15 weeks
 - Motion & strength
 - No difference @ 2 years



Cast Versus Surgery, What's the Evidence?

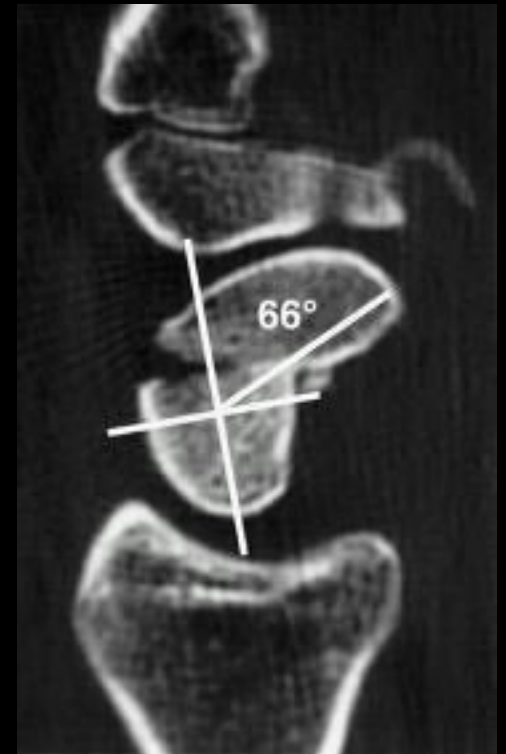
- Bond, et al (JBJS, 2001)
 - Benefit of surgical fixation for early return to ADLs
- Arora, et al (Arch Orthop Trauma, 2007)
 - Benefit of surgical fixation for early return to ADLs
- Dias, et al (JBJS, 2008)
 - 93 month f/u: no difference between cast and screw fixation
- Vinnars, et al (JBJS 2008)
 - No long term benefit of ORIF; ? complications

Cast Versus Surgery, What's the Evidence?

- Buijze, et al (JBJS 2010)
 - Meta-analysis of 419 patients in 8 randomized controlled trials
 - Surgery: higher patient satisfaction, grip strength, shorter time to union and RTW
- Ibrahim, et al (JHS 2011)
 - Meta-analysis of 363 patients in 6 controlled trials
 - Non-significant improvement in union, but **higher complication rates**

Surgical Indications

- Absolute indications for ORIF
 - Displaced > 1 mm
 - Proximal pole fractures
 - Comminution
 - Trans-scaphoid perilunate fracture/dislocations
 - Lateral intrascaphoid angle > 35 degrees (“humpback”)
 - Fractures with associated DISI
 - Athletes?



Scaphoid Fractures in Athletes

- **Distal Pole:**
 - Safest fracture to consider allowing athlete to compete in splint and cast when not competing
- **Waist:**
 - Sport/position dependent
 - Cast until heals vs. **early surgical treatment**
- **Proximal Pole:**
 - **Surgical treatment**, and no competition until fracture healed on CT scan
- **Old fracture:**
 - No urgency, can finish season in splint

Principles of Fixation

- Accurate reduction
- Screws better than pins
- Central third placement of screw
 - McCallister, Trumble JBJS 2003
 - Dodds and Slade JHS 2006



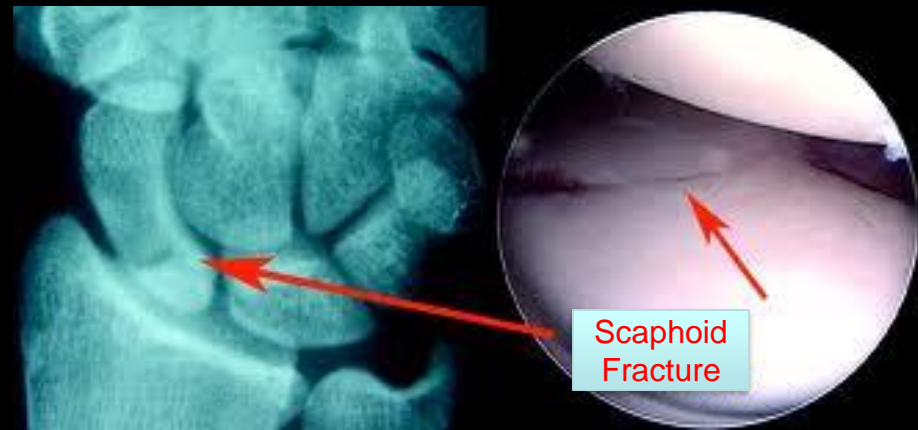
Techniques

- Arthroscopic Assisted
- Percutaneous or limited open
- Open reduction & fixation
 - Kirschner wires
 - Headless compression screws
 - Full thread stronger than smooth shank thread (Grewal, JOSR, 2011)



Arthroscopic-assisted percutaneous fixation of scaphoid fractures

- Slade, Gutow, Geissler (JBJS 2002)
 - Acute proximal pole & waist fractures; no AVN or collapse
 - 100% union
 - Average time to union: 12 weeks
 - May identify concomitant ligamentous injuries (20-30%)
 - Technofest



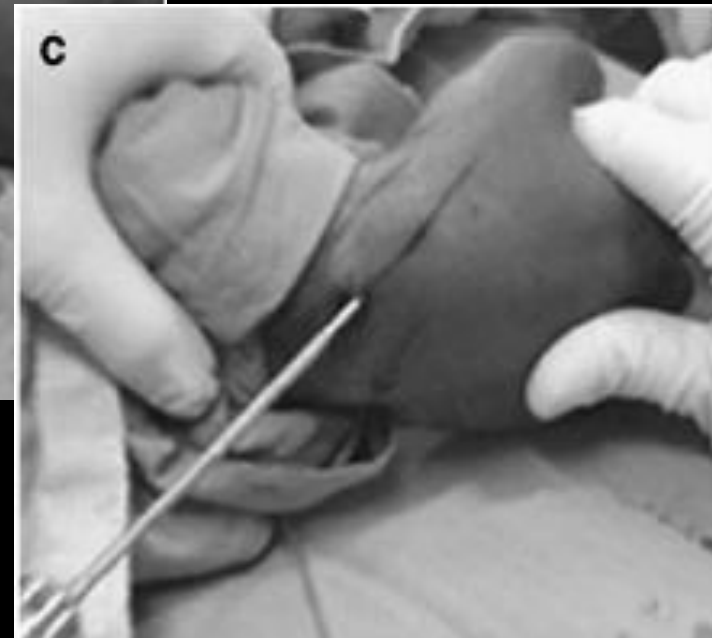
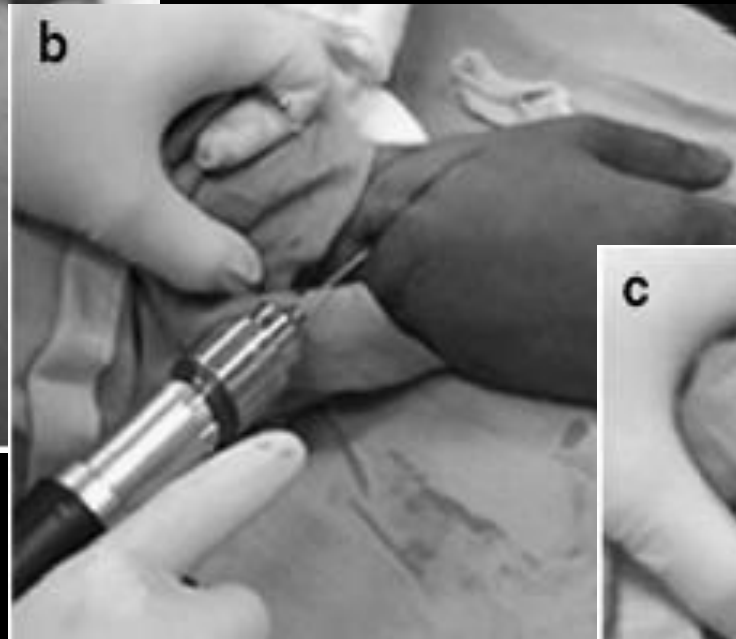
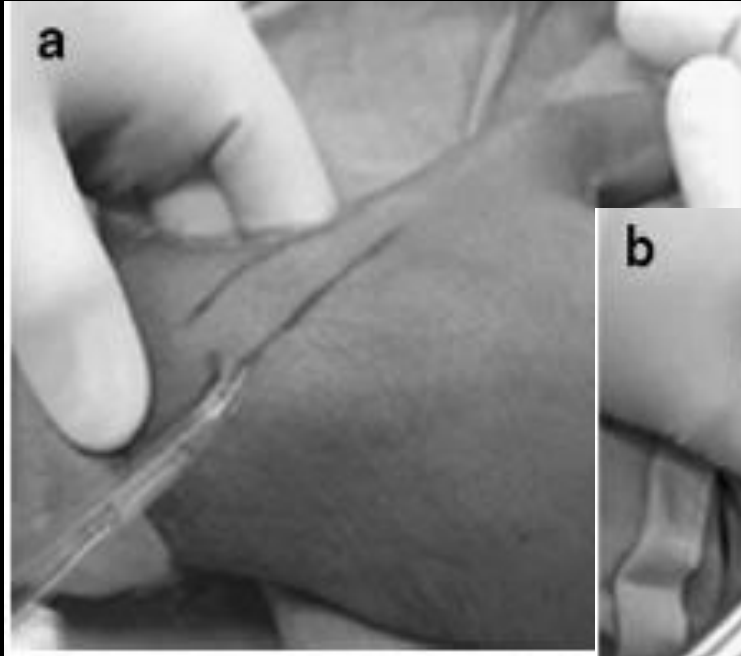
Open Approaches

- Dorsal
 - Indicated when have an associated carpal dislocation (perilunate)
 - Indicated for proximal pole fractures
 - Easier to place screw down central axis
- Palmar
 - Indicated for distal pole fractures
 - Humpback deformity
 - Easier starting location, but difficult to obtain central axis without violating the STT joint

Pre-Op Radiographs



Dorsal Percutaneous Approach

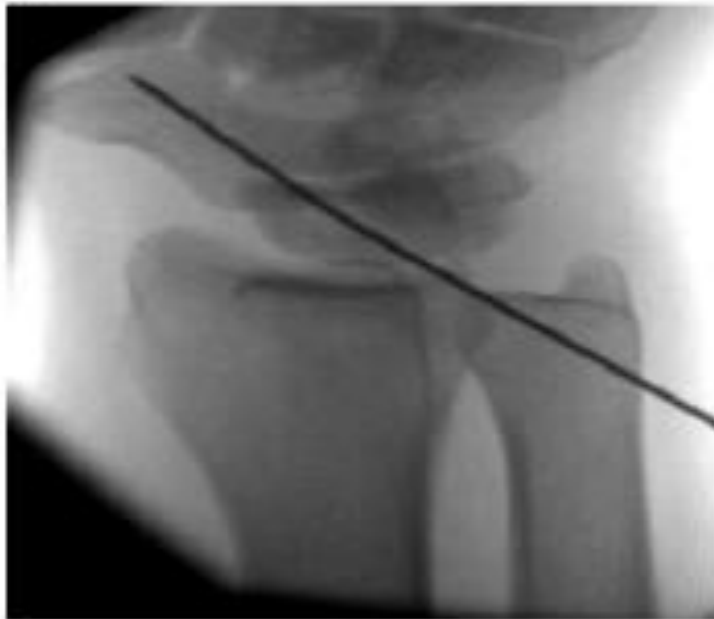




A



B



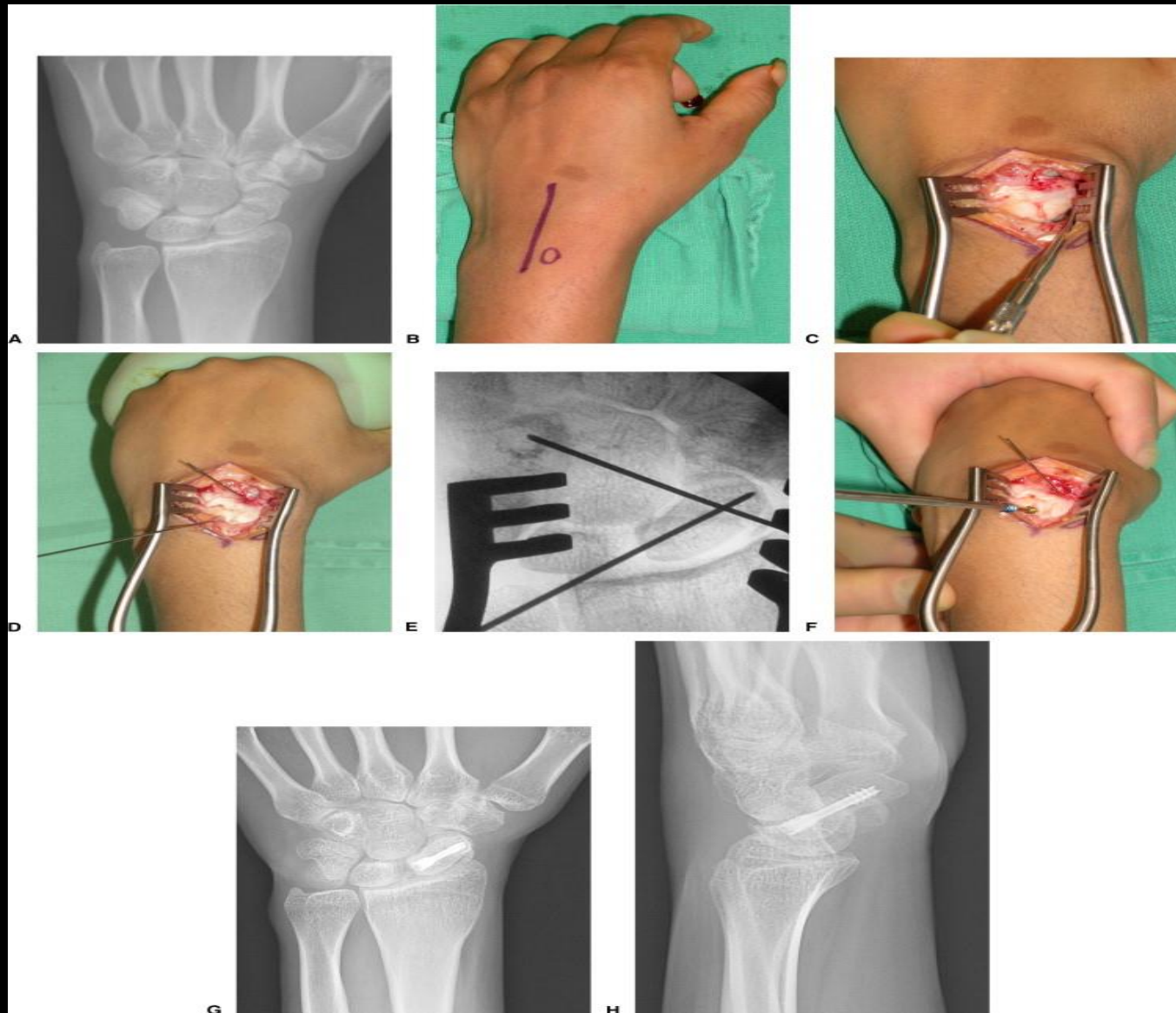
Dorsal Percutaneous Approach



Extensor tendons penetrated in 2/12 specimens

Adamany, et al., JHS 2008

Dorsal Open Approach



2 Weeks Post-Op



Tips for Volar Approach

SURGICAL TECHNIQUE

Optimization of Volar Percutaneous Screw Fixation for Scaphoid Waist Fractures Using Traction, Positioning, Imaging, and an Angiocatheter Guide

Dan A. Zlotolow, MD, Elisa Knutsen, MD, Jeffrey Yao, MD

Positioning



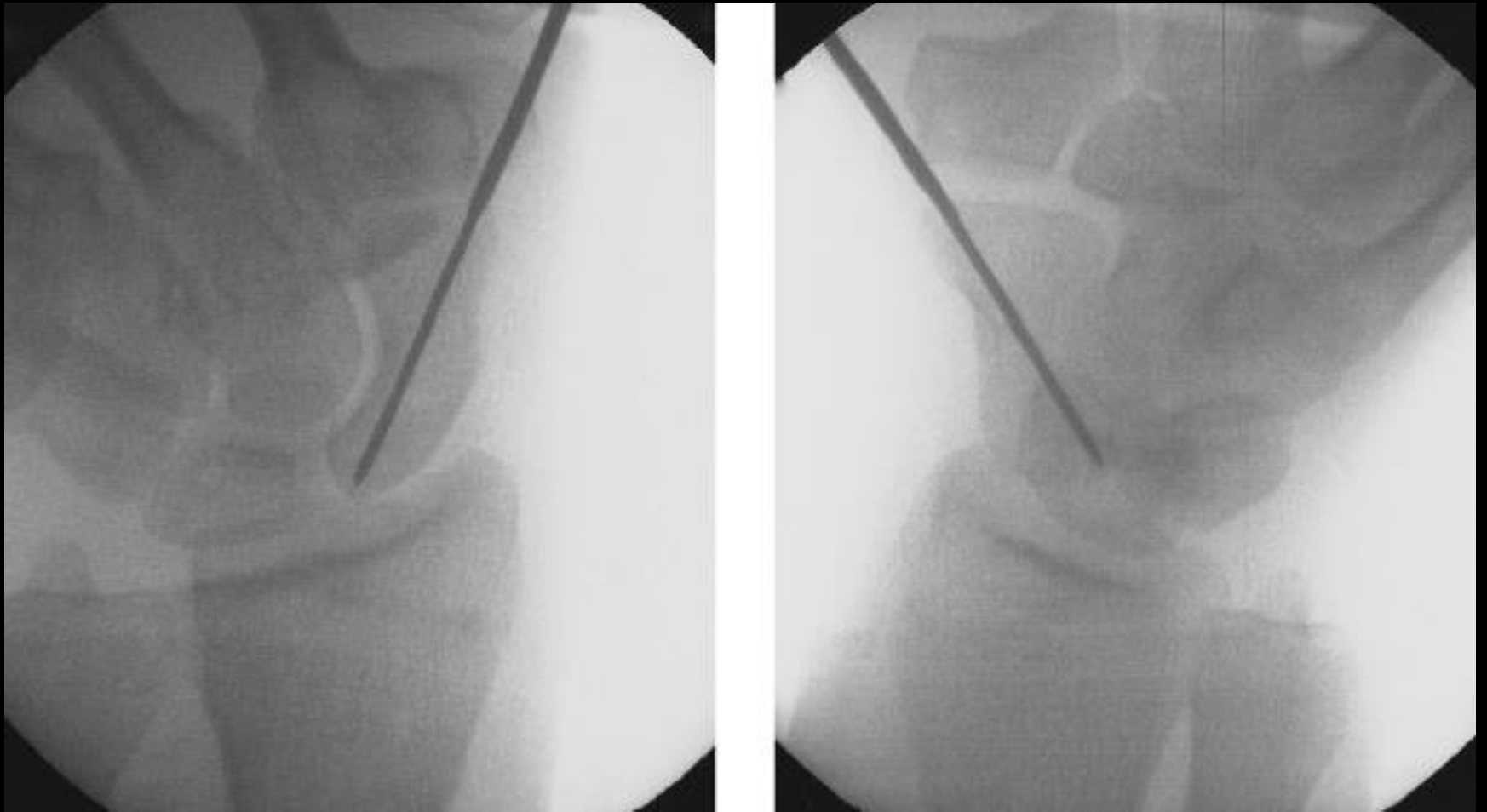
Locating Entry Point



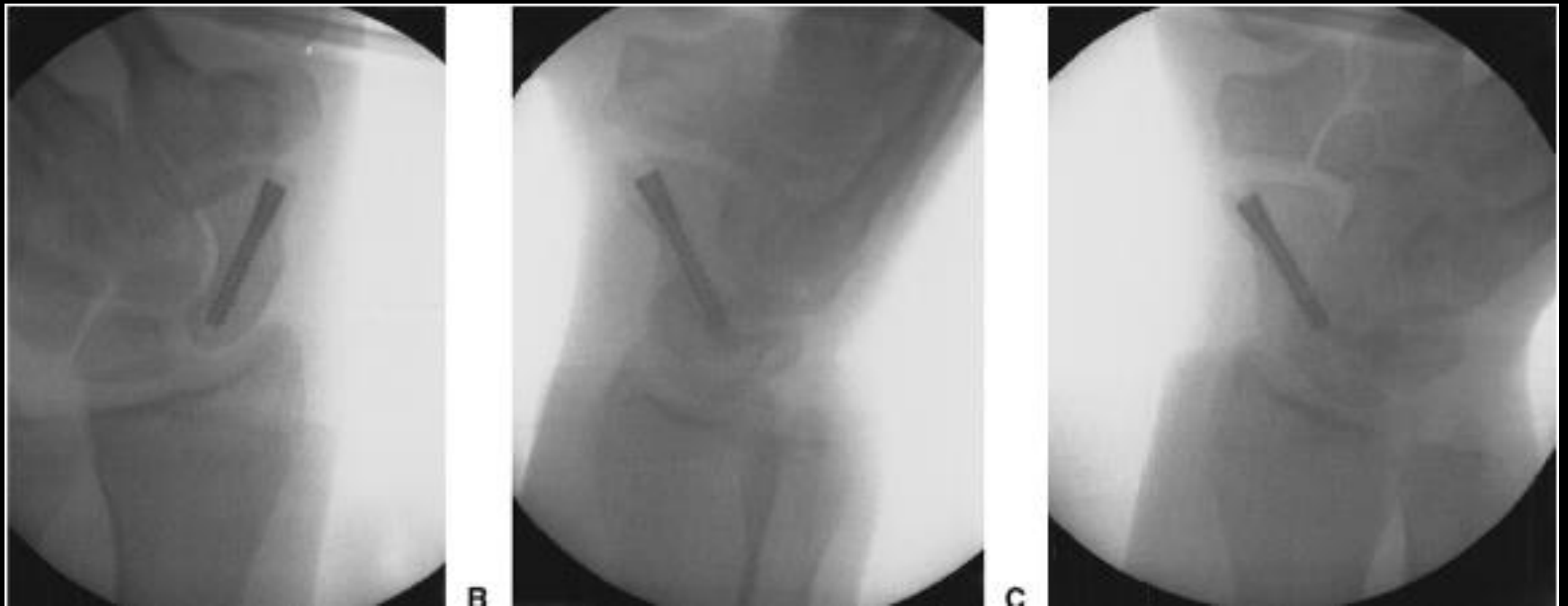
Use of 14G Angiocath



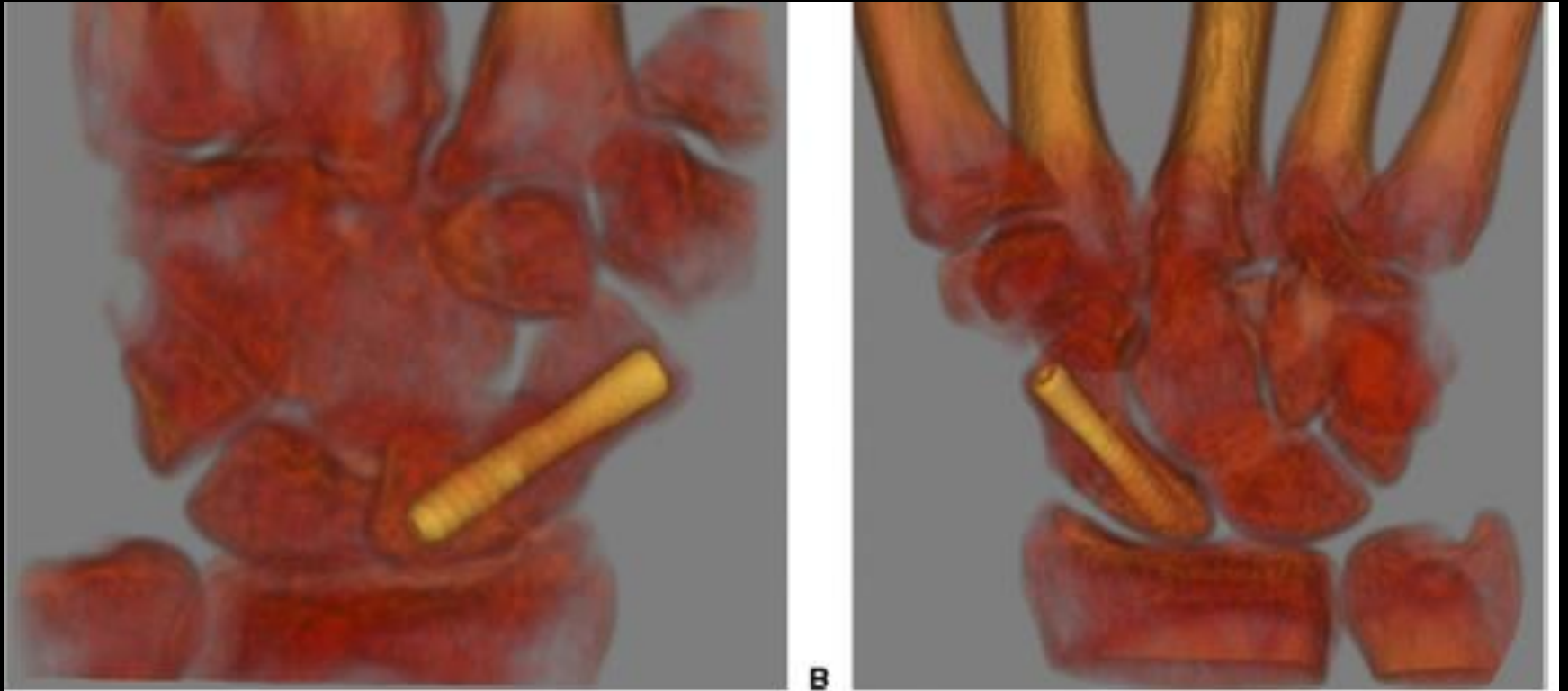
Place Guidewire Down Central Axis (Lever Against Trapezium)



Place Screw



CT Scan @ 6 weeks



Post-Operative Regimen

- 1-2 weeks: Splint immobilization
- 2-6 weeks: ROM exercises
- > 6 weeks: Strengthening exercises
- 12 weeks: Weight-lifting, pushups
- 4-5 mos: Contact sports

- Regimen accelerated for athletes

More Controversial Topics

CONTROVERSY



1 versus 2 Screws?

- Jurkowitsch, et al. *Arch Orthop Trauma Surg* . 2016
 - Biomechanically improved rotational stability of 2 headless compression screws vs 1
- Quadlbauer, et al. *Arch Orthop Trauma Surg* . 2017
 - 10/10 union unstable fxs with 2 x 2.2 mm HCS
 - 19/22 union unstable fxs with 1 x 3.0 mm HCS
 - Similar functional outcome and complications



Scaphoid Plating?

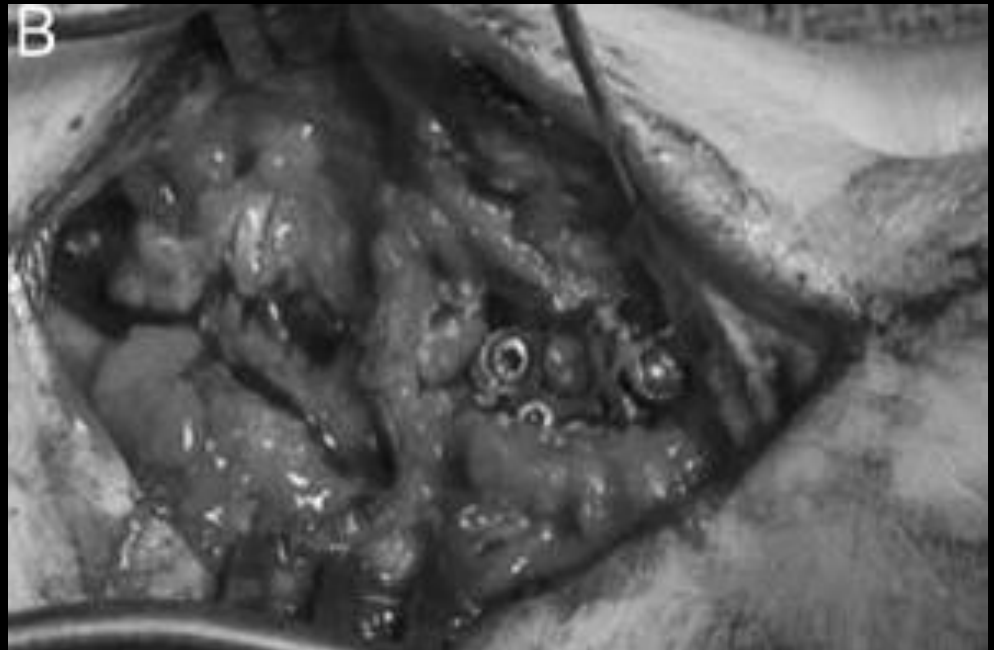
- Ender, H. (*Unfallheilkunde*. 1977)
- Supplanted by the Herbert screw (introduced in 1984)
- For Nonunions:
 - Leixnering, et al. (*JOT* 2011)
 - 11 patients
 - Median healing: 4 mos
 - DASH: 28
 - Ghonheim A (*JHS* 2011)
 - 13/14 patients healed at mean 3.8 months



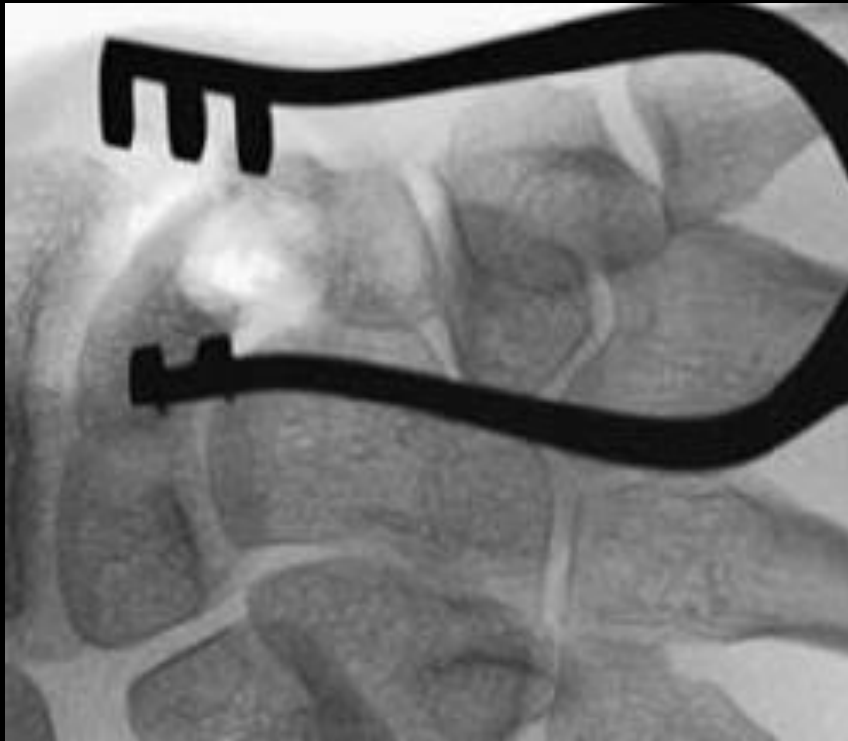
Scaphoid Plating?

Volar Plate Fixation of Recalcitrant Scaphoid Nonunions
With Volar Carpal Artery Vascularized Bone Graft

Seth D. Dodds, MD, Joseph T. Patterson, BS, and Andrea Halim, MD



Scaphoid Plating?



How Do I Treat Acute Scaphoid Fractures?

- Non-Displaced Fractures
 - Distal Pole
 - Short Arm Cast immobilization (no thumb)
 - Waist Fractures
 - Sedentary patient: Cast
 - Active patient: ORIF (1-2 weeks to ROM)
 - Proximal Pole
 - ORIF (2-4 weeks prior to ROM)
- Any displaced, unstable fractures : ORIF
- Athletes: ORIF



Thank You!

