

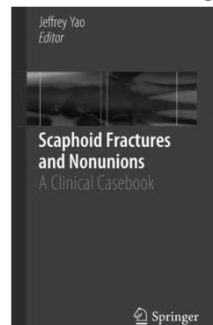
## How I Manage Acute Scaphoid Fractures



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## 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
  - 2<sup>nd</sup>/3<sup>rd</sup> 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



Courtesy of Mark E. Baratz, MD

## 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

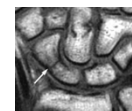
Scaphoid Oblique

- 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 Verdan 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?

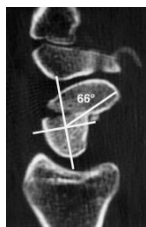
- Bond, et al (JBJS, 2001)
  - Benefit of surgical fixation for early return to ADLs
- Arora, et al (Arch Orthop Trauma, 2007)
  - Benefit of surgical fixation for early return to ADLs
- Dias, et al (JBJS, 2008)
  - 93 month f/u: no difference between cast and screw fixation
- Vinnars, et al (JBJS 2008)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



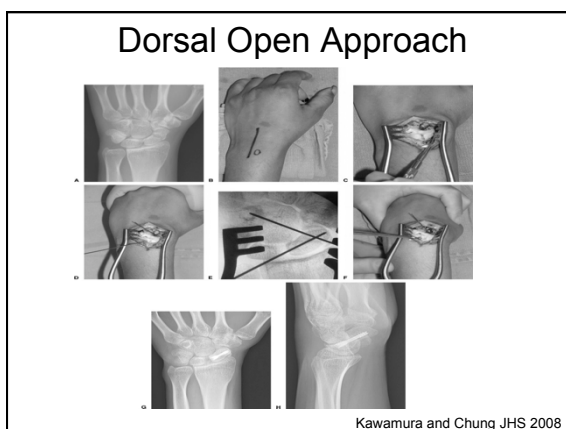
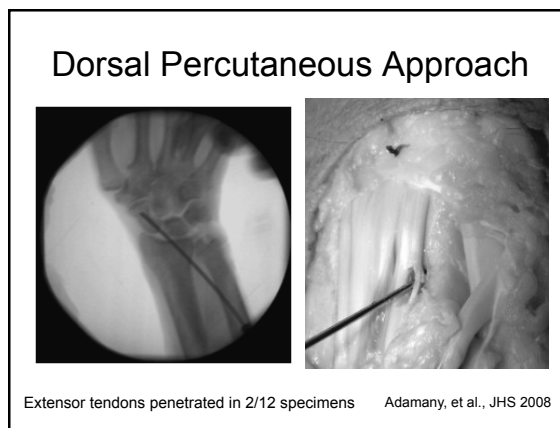
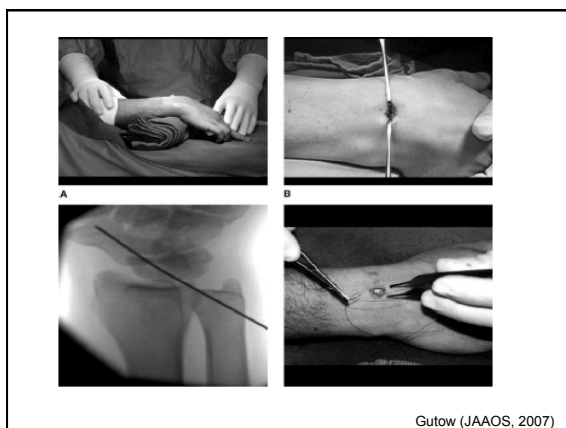
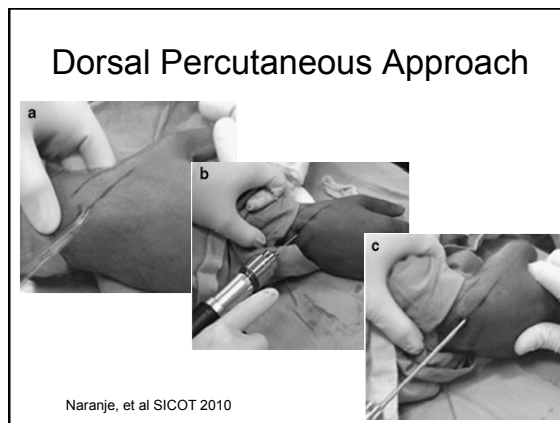
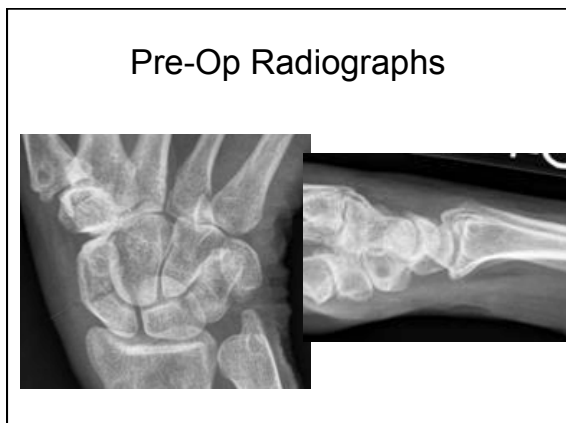
## Arthroscopic-assisted percutaneous fixation of scaphoid fractures

- 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



## 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



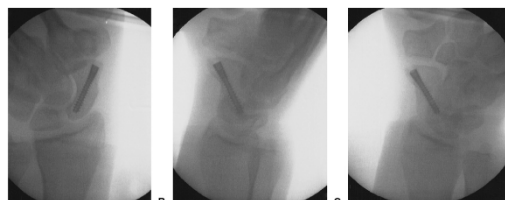
## Use of 14G Angiocath



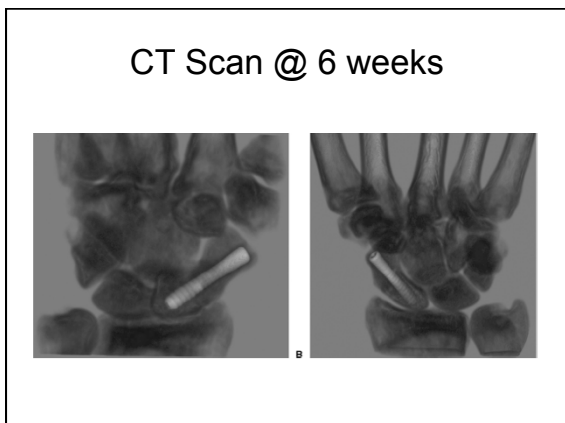
## Place Guidewire Down Central Axis (Lever Against Trapezium)



## Place Screw





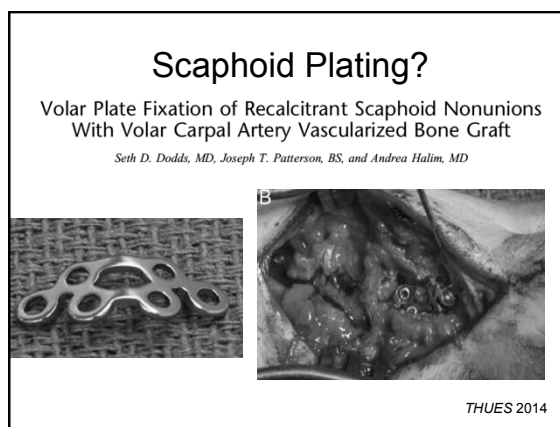


- ### Post-Operative Regimen
- 1-2 weeks: Splint immobilization
  - 2-6 weeks: ROM exercises
  - > 6 weeks: Strengthening exercises
  - 12 weeks: Weight-lifting, pushups
  - 4-5 mos: Contact sports
  
  - Regimen accelerated for athletes

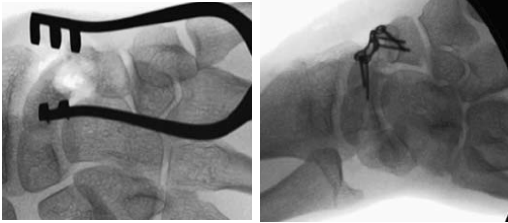


- ### 1 versus 2 Screws?
- Jurkowitsch, et al. *Arch Orthop Trauma Surg* . 2016
    - Biomechanically improved rotational stability of 2 headless compression screws vs 1
  - Quadlbauer, et al. *Arch Orthop Trauma Surg* . 2017
    - 10/10 union unstable fxs with 2 x 2.2 mm HCS
    - 19/22 union unstable 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?



## 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!

