How I Manage Acute Scaphoid Fractures

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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
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

PA view Scaphoid Oblique

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%)
  - 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 meta-analysis 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
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- Dias, et al (JBJS, 2008)
  - 93 month fl: no difference between cast and screw fixation
  - No long term benefit of ORIF; ? complications

Cast Versus Surgery, What’s the Evidence?

  - 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

Extensor tendons penetrated in 2/12 specimens

Adamany, et al., JHS 2008

Kawamura and Chung JHS 2008

Dorsal Open Approach

2 Weeks Post-Op
Tips for Volar Approach

Positioning

Locating Entry Point

Use of 14G Angiocath

Place Guidewire Down Central Axis (Lever Against Trapezium)

Place Screw

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

Dra A. Zivotows, MD, Elias Kemen, MD, Jeffrey Yan, MD
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

1 versus 2 Screws?

  - Biomechanically improved rotational stability of 2 headless compression screws vs 1
  - 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. Dobbs, MD, Joseph T. Patterson, BS, and Andrew Nobile, MD
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!