

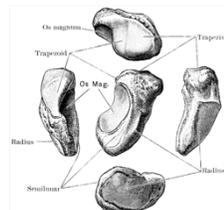
Current Concepts: Acute Scaphoid Fractures

Jerry I. Huang, M.D.
Program Director, UW Hand Fellowship
University of Washington Medical Ctr
AAHS Comprehensive Review Course
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Scaphoid Fracture

- Most common carpal fracture (60-70%)
- 80% cartilage
- Difficult to define central axis
- Concavity
 - Scaphocapitate
 - Volar surface

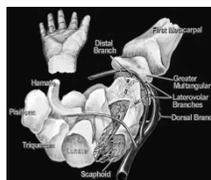


Anatomy



Blood Supply Unique

- Dorsal ridge vessels retrograde proximal 70-80%
- Volar branches distal 20-30%



Courtesy,
Prof Diego Fernandez



Treatment Guidelines

- Distal pole → 6 to 8 weeks cast immobilization
- Proximal pole → unstable, high risk of AVN → screw fixation
- Waist fracture → cast vs. surgery
- Nonunions → surgery



Case 1

- 21 y/o male with injury to right wrist after FOOSH injury
- Snuffbox tenderness
- 2 weeks in thumb spica cast so far



Injury Radiographs



Treatment Options

- Further imaging? CT Scan?
- Cast immobilization vs. Surgery
- Long arm vs. Short arm
- Dorsal vs. Volar
- Open vs. Percutaneous



Short Arm Thumb Spica Cast 4 Weeks Later



Surgical Options

- Dorsal vs. Volar
- Open vs. Percutaneous
- Return to sports?
- Full weight-bearing?



Advances in Treatment

- Imaging (CT and MRI)
- Surgical approaches
- Arthroscopic assisted fixation
- Headless cannulated screws
- Vascularized bone grafts (Dorsal, volar, and MFC)



CT Scan vs. Radiographs

- Plain radiographs
 - ➔ Poor interobserver reliability
 - Trabecular healing
 - Sclerosis at fracture line
 - Avascular necrosis proximal pole
 - ➔ Poor reliability for displacement



Acute Waist: Screw vs. Cast

- Faster radiographic union
- **Higher union rate??**
- Faster return to work, sports, ADLs
- ROM transiently better
- More complications with surgery
- No difference in functional outcome



Acute Waist: Screw vs. Cast

“Aggressive conservative management”

Consider surgery if no evidence of trabecular healing at 6-8 weeks...



SCIENTIFIC ARTICLE

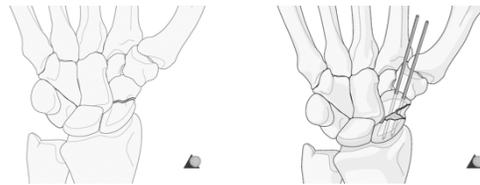
Use of Computed Tomography to Predict Union and Time to Union in Acute Scaphoid Fractures Treated Nonoperatively

Ruby Grewal, MD, MSc, Nina Suh, MD, Joy C. MacDermid, MSc, PhD

- Nonunion risk higher with translation, comminution, humpback
- Delayed union associated with translation, sclerosis, comminution, and location in proximal pole



Surgery Considerations



- Nondisplaced or minimally displaced
- Fracture comminution
- Waist or proximal pole
- Bone loss
- Nonunion



CENTRAL PLACEMENT OF THE SCREW IN SIMULATED FRACTURES OF THE SCAPHOID WAIST

A BIOMECHANICAL STUDY

BY WEN V. MCCALLISTER, MD, BEFF KNIGHT, MS, ROBERT KALAPPAN, AND THOMAS E. TROMBLE, MD
Investigation performed at the Department of Orthopaedics and Sports Medicine.

Background: Fracture rates of central pole waist. This cadaveric scaphoid offers a

Central screw 40% stronger

Methods: Eleven, a custom manufac Then a linear casted. The specimen was the proximal end of the distal pole. The load acting through the plunger was measured with use of a linear variable differential transformer. Stiffness, load at 2 mm of displacement, load at failure, and mechanism of failure were measured, and the two groups were compared with regard to stiffness and strength.

Results: Central placement of the screw in the proximal fragment of the scaphoid had superior results compared with those after eccentric positioning of the screw. Fixation with central placement of the screw demonstrated 43% greater stiffness (22.7 N per mm compared with 15.9 N per mm; $p < 0.02$), 113% greater load at 2 mm of displacement (120 N compared with 55.1 N; $p < 0.01$), and 59% greater load at failure (112 N compared with 51.5 N; $p < 0.05$).

Conclusions and Clinical Relevance: Central placement of the screw in the proximal fragment of the scaphoid offers a biomechanical advantage in the internal fixation of an osteotomy of the scaphoid waist. Clinical efforts and techniques that facilitate central placement of the screw in the fixation of fractures of the scaphoid waist should be encouraged.



Screw Fixation of Scaphoid Fractures: A Biomechanical Assessment of Screw Length and Screw Augmentation

Seth D. Dodds, MD, Manohar M. Panjabi, PhD, Joseph F. Slade III, MD

From the Department of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven, CT.

Conclusions: “Under physiologically applied loading of cadaveric wrists with unstable scaphoid waist fractures the long screw provided significantly greater stability than the short screw



Goals of Surgery

- ✓ • Central screw placement
- ✓ • Longest screw
- Dorsal vs. Volar
- Open vs. Percutaneous



Volar or Dorsal?



SCIENTIFIC ARTICLE

Percutaneous Screw Fixation for Scaphoid Fracture: A Comparison Between the Dorsal and the Volar Approaches

In-Ho Jeon, MD, Ivan D. Micic, MD, Chang-Wug Oh, MD, Byung-Chul Park, MD, Poong-Taek Kim, MD

- Retrospective review 41 pts (JHS 2009)
- 19 volar and 22 dorsal
- Dorsal better central screw placement
- No difference in functional outcome and time to bony union



Volar Screw Placement

- Trapezium

-
-
-



Indications for Percutaneous

- Acute or subacute nondisplaced fx
- Mildly displaced fracture that is easily close reduced
- Delayed union or fibrous nonunion without AVN, without sclerosis, without deformity, and without gap



SCIENTIFIC ARTICLE

Percutaneous Fixation of the Scaphoid Through a Dorsal Approach: An Anatomic Study

Damon C. Adamany, MD, Elizabeth A. Mikola, MD, Bonnie J. Fraser, MD

Purpose: Percutaneous surgical treatment of nondisplaced scaphoid fractures is becoming more common. Although the surgical anatomy at risk has been well described for the volar approach to the scaphoid, we have not found articles elucidating the dangers with a percutaneous dorsal approach. Additionally, direct placement of the screw is not possible with a percutaneous dorsal approach to the scaphoid because of the risk of fracture of the subchondral bone.

Methods: Cadaveric percutaneous fixation of the scaphoid through a dorsal approach to the scaphoid was performed in 10 specimens. The distance from the guidewire to various anatomic structures was measured. The distance that the screw was protruding above or buried below the subchondral bone was also measured.

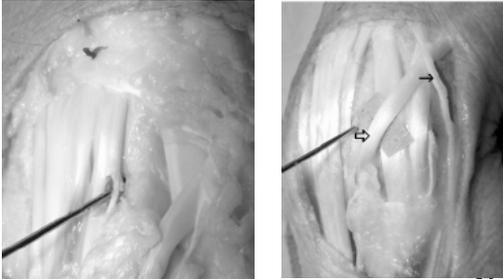
Results: The distances from the guidewire to the posterior interosseous nerve, to extensor digitorum communis to the index, and to extensor indicis proprius were 2.2 mm, 2.2 mm, and 3.1 mm, respectively. These structures were most at risk. The screw was prominent (above the subchondral bone) in 2 of 10 specimens and flush with or buried in the remaining 8 specimens.

Conclusions: The results of this study show that there are anatomic structures at risk of injury with dorsal percutaneous placement of a headless screw into the scaphoid. Despite using live and static fluoroscopy views, we incorrectly placed the screw above the subchondral bone in 2 of the specimens. We support use of a limited incision when internally fixing a scaphoid from the dorsal approach. (*J Hand Surg* 2008;33A:327–331. Copyright © 2008 by the American Society for Surgery of the Hand.)

Key words: Anatomic, dorsal, fixation, percutaneous, scaphoid.

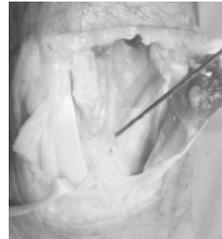


Dorsal Percutaneous



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Dorsal Percutaneous



⇒ PIN Injury → Painful Neuroma?

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Surgical Case

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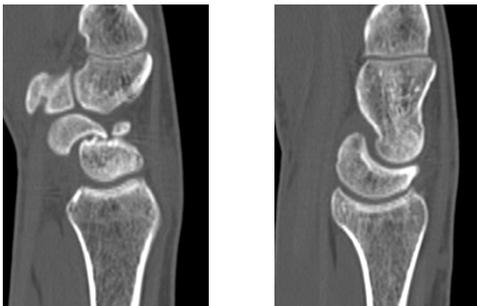
Open Approach

- Fracture displacement or comminution
- Nonunion with humpback deformity or requiring bone grafting
- Volar better exposure especially with humpback
- Dorsal proximal pole



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Humpback + DISI



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K-Wire Joysticks Extend and Supinate

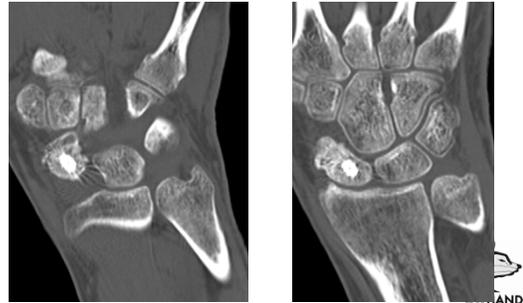


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Surgical Case



CT at 3 Months to Confirm Union



Summary

- Understand unique anatomy of the scaphoid
- Surgical treatment early ROM, faster return to work, sports
- Dorsal vs. volar and open vs. percutaneous fixation
- CT scan to confirm union

