SCAPHOID FRACTURES: FIXATION TIMING AND TECHNIQUE

Kevin Vogeli MD, PhD

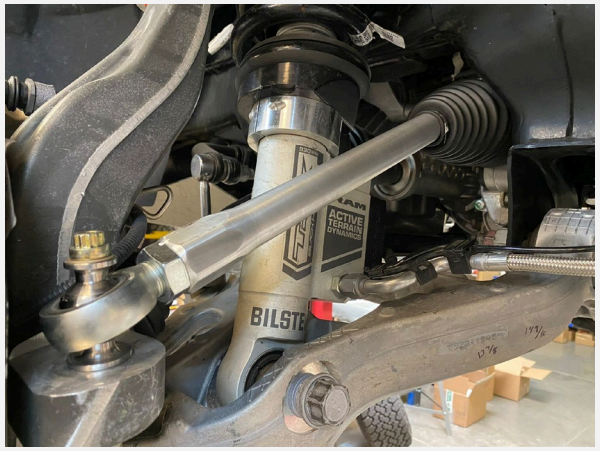
Dept. Orthopedic Surgery

Kaiser Permanente

Oakland, CA

SCAPHOID: AWKWARD, BUT IMPORTANT

- The scaphoid links the proximal and distal carpal rows
- Acts as a "tie-rod"
- Why is it an "awkward but important little bone"?



Barton N.J. 1996

SCAPHOID FRACTURES

- Most commonly fractured carpal bone
  - 1.47 fractures per 100,000 person-years
  - 2:1 Male : female ratio
- 11% of all fractures in the hand
- Mechanism usually fall on extended wrist

Van Tassel *et. al.*2010, Wolf *et. al.*2010

SCAPHOID FRACTURES

Herbert

"Stable" "Unstable"

A1

B1

B3

A2

B2

B4

SCAPHOID FRACTURES

- Untreated scaphoid fractures lead to nonunions
- Scaphoid Nonunions lead to degenerative changes in the wrist (SNAC)

Dr. Milan Stevanovic
"big problem"

Ruby and Leslie, 1987

TREATMENT OF SCAPHOID FRACTURES: TIMING

- Multiple retrospective studies of Scaphoid Nonunions
  - 31-53% of patients had a delay in treatment of 4+weeks
- Denmark 1988: Delay of 4 weeks 45% chance of Nonunion

Yin *et. Al. 2022, R*eigstad *et. Al. 2012,* Hiedsiek *et.Al.* 2015, Langhoff and Andersen 1988

TREATMENT OF SCAPHOID FRACTURES: TIMING

- SWIFFT Trial: multicenter, open label, randomized superiority trial
- 439 (408) patients with minimally displaced scaphoid waist fractures(2mm or less) randomized to "aggressive casting" or immediate Fixation, 1 year follow-up
- 1 Non-union in fixation group, 4 in casting group
- need to fix 73 scaphoids to prevent 1 nonunion
- casting 6-12 weeks prior to fixation does not significantly increase nonunion rate.

Dias *et. Al. 2020*

DIAGNOSIS OF SCAPHOID FRACTURES: TIMING

Xrays: 25% false negative rate for non-displaced scaphoid fracture

MRI: near 100% sens and specificity

CT Scan: 72% sens and 100% specificity

Waeckerle 1987,Patel *et. Al. 2013,* Mallee *et. Al. 2015,*

SCAPHOID FRACTURES: FIXATION

- Cannulated Headless compression screws
- Can be inserted Dorsal or Volar
- Percutaneous or open approach
- Conical design provides more compression as compared to shank design

Vishwanathan *et. Al.* 2019

SCAPHOID SCREW FIXATION

Location, Location, Location

- Centrally placed screws have greater stiffness and load to failure
- Longer screws have less fracture fragment motion

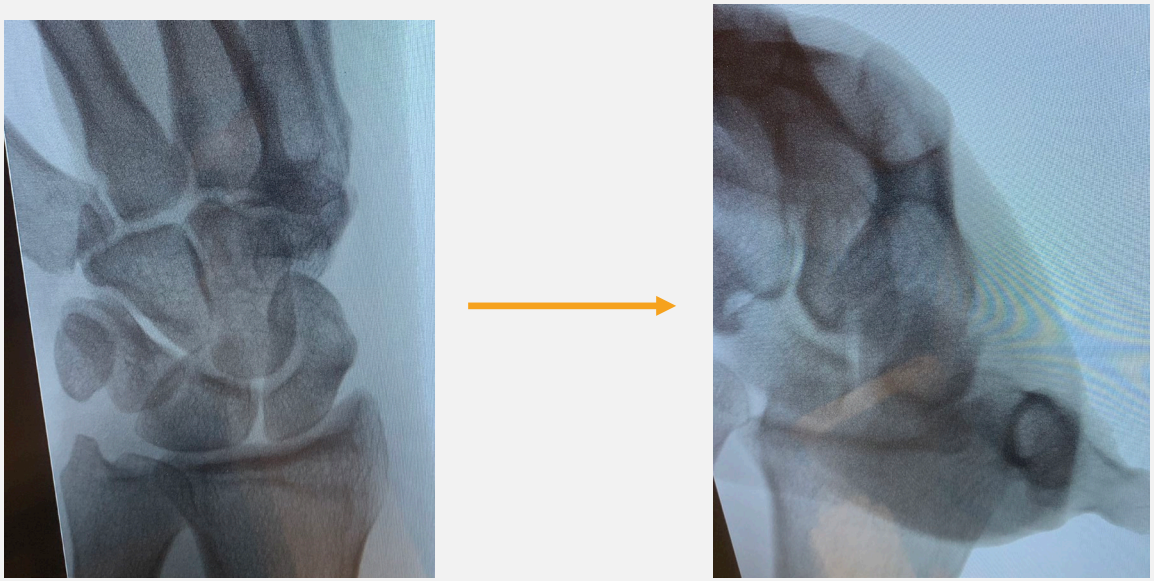
Dodds et. *Al.* 2006, McCallister *et. Al.* 2003

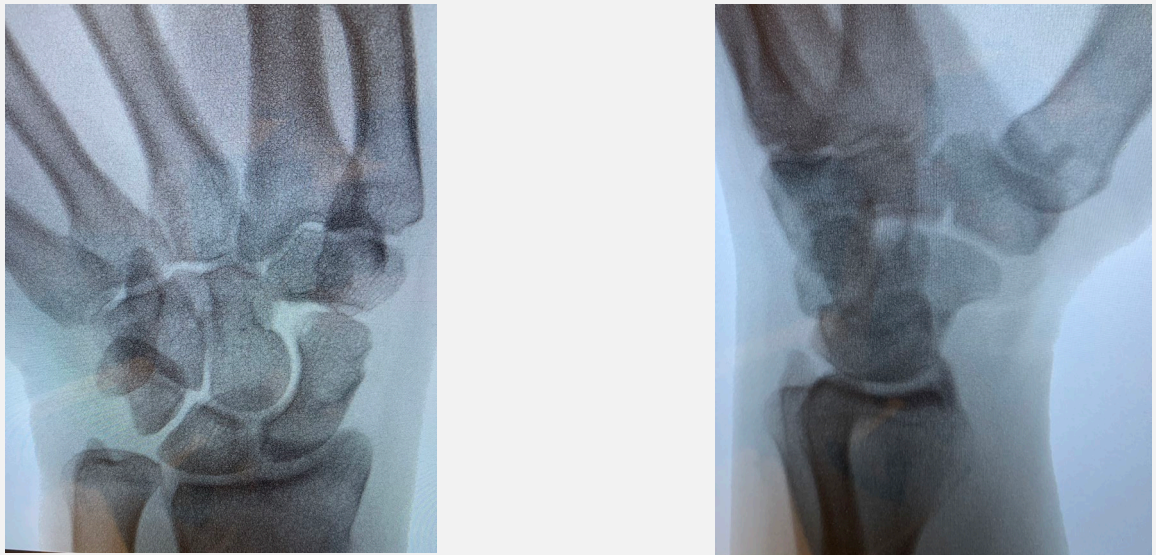
SCAPHOID SCREW FIXATION: TECHNIQUE

- Easier to place screw in central axis from Dorsal approach as compared to Volar, no difference *in vivo*
- during percutaneous Volar insertion need to be trans-trapezial 20% of the time for central insertion

Jeon *et. Al. 2009*, Vaynrub *et. Al.* 2014

DORSAL PERCUTANEOUS FIXATION





Slade and Jaskwhich 2001

CASES:

24 M s/p Mountain bike accident

24 M s/p Mountain bike accident

s/p ORIF distal radius and scaphoid
3 months postop

55y/o RHD M s/p MVA



Xrays at the time of injury

55y/o RHD M s/p MVA

Xrays 15 months after injury

55y/o RHD M s/p MVA

s/p ORIF with distal radius autograft
4months postop

REFERENCES

- Arsalan-Werner A, Sauerbier M, Mehling IM. Current concepts for the treatment of acute scaphoid fractures. Eur J Trauma Emerg Surg 2016;42(1): 3–10.
- Dodds SD, Panjabi MM, Slade JF. Screw fixation of scaphoid fractures: a biomechanical assessment of screw length and screw augmentation. J Hand Surg Am 2006;31(3):405–13.
- Dias JJ, Brealey SD, Fairhurst C, Amirfeyz R, Bhowal B, Blewitt N, Brewster M, Brown D, Choudhary S, Coapes C, Cook L, Costa M, Davis T, Di Mascio L, Giddins G, Hedley H, Hewitt C, Hinde S, Hobby J, Hodgson S, Jefferson L, Jeyapalan K, Johnston P, Jones J, Keding A, Leighton P, Logan A, Mason W, McAndrew A, McNab I, Muir L, Nicholl J, Northgraves M, Palmer J, Poulter R, Rahimtoola Z, Rangan A, Richards S, Richardson G, Stuart P, Taub N, Tavakkolizadeh A, Tew G, Thompson J, Torgerson D, Warwick D. Surgery versus cast immobilisation for adults with a bicortical fracture of the scaphoid waist (SWIFFT): a pragmatic, multicentre, open-label, randomised superiority trial. Lancet. 2020 Aug 8;396(10248):390-401
- Jenkins PJ, Slade K, Huntley JS, et al. A comparative analysis of the accuracy, diagnostic uncertainty and cost of imaging modalities in suspected scaphoid fractures. Injury 2008;39(7):768–74
- Jeon IH, Micic ID, Oh CW, Park BC, Kim PT. Percutaneous screw fixation for scaphoid fracture: a comparison between the dorsal and the volar approaches. J Hand Surg Am. 2009;34(2):228e236.e1
- Mallee WH, Wang J, Poolman RW, et al. Computed tomography versus magnetic resonance imaging versus bone scintigraphy for clinically suspected scaphoid fractures in patients with negative plain ra- diographs. Cochrane Database Syst Rev 2015;(6): CD010023.
- McCallister WV, Knight J, Kaliappan R, Trumble TE. Central placement of the screw in simulated fractures of the scaphoid waist: a biomechanical study. J Bone Joint Surg 2003;85A:72–77.
- Patel NK, Davies N, Mirza Z, et al. Cost and clinical effectiveness of MRI in occult scaphoid fractures: a randomised controlled trial. Emerg Med J 2013; 30(3):202–7.
- Ruby LK, Leslie BM. Wrist arthritis associated with scaphoid nonunion. Hand Clin 1987;3:529–37.
- Slade JF, Jaskwhich D. Percutaneous fixation of scaphoid fractures. Hand Clin 2001;17:553–74.
- Van Tassel DC, Owens BD, Wolf JM. Incidence estimates and demographics of scaphoid fracture in the U.S. population. J Hand Surg Am 2010;35(8): 1242–5.
- Vaynrub M, Carey JN, Stevanovic MV, Ghiassi A. Volar percutaneous screw fixation of the scaphoid: a cadaveric study. J Hand Surg Am. 2014 May;39(5):867-71.
- Waeckerle JF. A prospective study identifying the sensitivity of radiographic findings and the efficacy of clinical findings in carpal navicular fractures. Ann Emerg Med 1987;16(7):733–7.
- Wolf JM, Dawson L, Mountcastle SB, et al. The incidence of scaphoid fracture in a military population. Injury 2009;40(12):1316–9.