Carpal Fractures and Dislocations

Wichita Orthopaedic Trauma Forum

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Carpal Bone Fractures – Epidemiology

- Scaphoid fractures account for 70%
- Triquetral fractures account for about 18%
- All other carpal bone fractures are rare, about 12%

Incidence Estimates and Demographics of Scaphoid Fracture in the U.S. Population

Van Tassel et al., JHS 2010; 35A: 1242–45
- Data from National Electronic Injury Surveillance System (NEISS) basis for estimated incidence
- Scaphoid fractures are 2.4% of all wrist fractures, an incidence of 1.47 fractures per 100,000 person–yrs
- Males from 10–19 yrs are at highest risk for fracture
- Males account for 66%, females 34% of scaphoid fractures

The Benefit of Magnetic Resonance Imaging for Patients With Posttraumatic Radial Wrist Tenderness

Jorgsholm et al., JHS 2013; 38A: 29–33
- Prospective review 296 patients over 3–year period with radial-sided wrist tenderness on clinical exam after injury
- 300 wrists were evaluated with 0.23T MRI
- Found 224 fractures in 196 wrists (42% scaphoid, 15% distal radius, 6% triquetrum, 5% capitate)
- MRI better than XR or CT scan to identify occult wrist fracture
- Suggested that early MRI evaluation of these patients may be more cost effective than trial of plaster immobilization and interval re–evaluation

Herbert Classification of Scaphoid Fractures

- Type A – Stable acute fractures (A1 – tubercle, A2 – incomplete waist)
- Type B – Unstable acute fractures (B1 – distal oblique, B2 – complete waist, B3 – proximal pole, B4 – trans–scaphoid perilunate)
- Type C – Delayed union
- Type D – Established nonunion (D1 – fibrous, D2 – pseudarthrosis)

Comparison of Short and Long Thumb–Spica Casts for Non–Displaced Fractures of the Carpal Scaphoid

Gellman et al., JBJS 1989; 71A: 354–57
- Prospective, randomized trial 51 patients with nondisplaced scaphoid fractures treated in short–arm TSC (23) or long–arm TSC (28) for first 6 weeks, then SATSC
- LATSC group – united sooner 9.5 weeks (vs 12.7 weeks) and more reliably (no nonunions, fewer delayed unions)
- Study recommendation was for initial period of 6 weeks in LATSC
- Therapeutic Level I study (USC)
Cast Immobilization With and Without Immobilization of the Thumb for Nondisplaced & Minimally Displaced Scaphoid Waist Fractures: A Multicenter, Randomized, Controlled Trial  
Buijze et al., JHS 2014; 39A: 621–27  
- Prospective, randomized trial 62 patients w/CT-confirmed or MRI-confirmed scaphoid fractures treated in SAC w/thumb or w/o thumb  
- No difference in outcomes with respect to radiographic extent of union at 10 weeks, wrist pain, wrist ROM, grip strength, Mayo & DASH scores  
- Study conclusion was that immobilization of thumb is unnecessary  
- Therapeutic Level I study (Netherlands, Harvard University)

Percutaneous screw fixation vs conservative treatment for fractures of the waist of the scaphoid  
McQueen et al., JBJS 2008; 90B: 66–71  
- Prospective, randomized study 60 patients (30 treated SAC with thumb free, 30 treated percutaneous Acurtrak screw) 1–year follow-up  
- No difference in grip or pinch strength  
- There were more nonunions, malunions in nonsurgical group but not statistically significant  
- Earlier RTW (3.8 vs 11.4 wks), RTS (6.4 vs 15.5 wks) in the surgical group  
- Study favored operative treatment due to earlier return to work and earlier return to sport  
- Therapeutic Level I study (Scotland)

Surgical vs Nonsurgical Treatment of Minimally Displaced and Undisplaced Scaphoid Waist Fx: Meta–Analyses of Randomized Controlled Trials  
Ibrahim et al., JHS 2011; 36A: 1759–68  
- Six studies (1990 to 2009) with 363 patients were analyzed  
- No outcome difference in wrist ROM, grip strength  
- Complications (CRPS, STT arthrosis) were more frequent with surgery  
- Conservative treatment was recommended  
- Therapeutic Level I study (UK)

Conservative Treatment vs Arthroscopic-Assisted Screw Fixation of Scaphoid Waist Fractures: A Randomized Trial with Minimum 4-Year Follow-Up  
Clementson et al., JHS 2015; 40A: 1341–48  
- Prospective, randomized study (24 patients treated SATSC, 14 patients treated percutaneous antegrade screw fixation)  
- No difference in wrist ROM, grip & pinch strength at mean 6–yr follow-up  
- More had radioscaphoid arthrosis in surgical group  
- Study conclusion was that nondisplaced or minimally displaced scaphoid waist fractures should be treated nonoperatively  
- Therapeutic Level II study (Sweden)
Optimization of Volar Percutaneous Screw Fixation for Scaphoid Waist Fractures Using Traction, Positioning, Imaging and an Angiocatheter Guide
Zlotolow et al., JHS 2011; 36A: 916–21
- For nondisplaced or reducible scaphoid fractures
- Lateral thumb traction with wrist in extension, ulnar deviation
- AP, lateral fluoroscopy to optimize guide wire placement
- 14 gauge angiocatheter needle to localize distal pole entry
- Immobilize until union achieved, usually 6–8 weeks

Smoking increases failure rate of operation for established non-union of the scaphoid bone
Dinah et al., Int Ortho 2007; 31: 503–05
- Retrospective review 34 patients, 37 operations for established scaphoid nonunion
- Mean age 26.8 yrs, mean delay to operation 11.9 mo
- Treated with internal fixation and autologous bone graft
- Union rate for non-smokers 82.4%, for smokers 40%
- Smoking associated with failed operative treatment of established scaphoid nonunions

The Use of Low–Intensity Pulsed Ultrasound Bone Stimulators for Fractures of the Hand and Upper Extremity
Riboh et al., JHS 2012; 37A: 1456–60
- One randomized controlled trial of LIPUS in 30 pts with acute scaphoid fractures showed a 30% decrease in healing time
- Studies of scaphoid nonunions were not well–controlled
- There is evidence supporting the use of LIPUS for acute scaphoid fractures, but not for delayed unions or nonunions
- Evidence–based review (Duke University)

Proximal Pole Scaphoid Fractures: A Computed Tomographic Assessment of Outcomes
Grewal et al., JHS 2016; 41A: 54–58
- 53 patients with nondisplaced or minimally displaced proximal pole scaphoid fractures (presenting within 6 weeks) were treated in SATSC
- Overall union rate was 90%, mean time to union was 14 weeks
- Longer union times were associated with fracture translation or comminution and with cyst formation
- Prognostic Level IV study (Canada)

Hook of Hamate Pull Test
Wright et al., JHS 2010; 35A: 1887–89
- Used to diagnose occult hook of hamate fractures
- Wrist pain is reproduced when ring and small finger FDPs are loaded with wrist in full ulnar deviation
- Test is highly sensitive and was positive in five consecutive patients treated for hook of hamate fractures in this study
16  Outcomes of Hook of Hamate Fracture Excision in High-Level Amateur Athletes
Devers et al., JHS 2013; 38A: 72–76
- Retrospective review 11 patients with 12 hook of hamate fractures
- All athletes returned to sport an average 6 weeks postop
- No difference in preinjury and postop performance scores
- Hook of hamate excision is safe and effective technique as treatment for hook of hamate fractures
- Therapeutic Level IV study (Vanderbilt)

17  Hamatometacarpal fracture–dislocation: Classification and treatment
Cain et al., JHS 1987; 12A: 762–67
- Case series of 17 patients with hamatometacarpal fracture–dislocations, all w/4th and/or 5th MC fractures and/or dislocations
- Type 1 – no hamate fx or avulsion, type 2 – hamate comminution, type 3 – hamate coronal split
- These injuries usually require ORIF, though some type 1 injuries may be treated with CRPP
- Semi–pronated lateral radiograph may help confirm diagnosis

18  Carpometacarpal Dislocations
Lawlis et al., JBJS 1991; 73A: 52–59
- Case series of 20 patients with CMCJ dislocations of one or more joints
- Only 5 patients in series had all four IMRS CMCJs dislocated
- In this series, there were 17 males, 14 dominant hands and all were high-energy injuries
- Long–term follow–up mean 6.5 years
- 13 of 15 patients treated with ORIF within 3 weeks of injury had excellent outcomes

19  Carpal dislocations: Pathomechanics and progressive perilunar instability
Mayfield et al., JHS 1980; 5A: 226–41
- Stage I – radioscaphocapitate ligament, scapholunate interosseous ligament tears
- Stage II – capitolunate dislocation
- Stage III – lunotriquetral ligament tear
- Stage IV – dorsal radiocarpal ligament tear (short radiolunate and long radiolunate ligaments remain intact)

20  Lichtman Classification of Kienbock’s Disease
- Stage I – wrist radiographs normal, MRI signal change
- Stage 2 – wrist radiographs show lunate sclerosis and/or fracture
- Stage 3 – lunate articular collapse (3A – normal carpal height and alignment, 3B – loss carpal height, proximal capitate migration, fixed scaphoid rotation)
- Stage 4 – lunate collapse, perilunate arthrosis
Osteotomy of the Radius Without Shortening for Kienböck Disease: A 10-Year Follow-Up
Blanco et al., JHS 2012; 37A: 2221–25

• 14 patients had distal radial osteotomy without altering radial length or inclination
• All but one were a mean of 1.8 mm ulnar negative variance
• 11 patients available at follow-up all had decreased wrist pain, improved wrist motion & grip strength
• Study concluded that any local wrist surgery may improve lunate vascularity and in turn decrease wrist pain
• Therapeutic Level IV study (Argentina)