Traumatology of the scaphoid and scapholunate ligament complex

Frank Kolo
Laszlo Dongo
Stéphane Kämpfen

Philippe Cuénod
Alexander De Smet
Michaël Papaloïzos

Centre de chirurgie et de thérapie de la main
Genève
Fracture patterns and classification

www.swisshandsurgery.ch

Dr. Laszlo Dongo
Clinique CH8
10.12.2015
Incidence

• Fractures of the scaphoid represent nearly 2 percent of all the fractures. (Leslie and Dickson 1981)

• The scaphoid is the most common of the carpal bones to be fractured; it accounts for 51 to 62 percent of all the carpal fractures. (Gasser 1965)
Fracture patterns

• In 11 of the 47 retrospective cases, it proved impossible to define fully the three-dimensional pattern.

• In the 80 scaphoids for which a fracture line could be accurately defined, there appeared to be three main fracture patterns involving: 1) the surgical waist; 2) the dorsal sulcus; or 3) the proximal pole.
Waist fracture
Classifications

- There are many classifications of the scaphoid fractures but three classifications are more or less commonly used in the clinical practice including the Mayo, the Russe and the Herbert classification.
## Comparison by anatomic sites

<table>
<thead>
<tr>
<th>Site of fracture</th>
<th>Russe\textsuperscript{11}</th>
<th>Herbert\textsuperscript{12}</th>
<th>Mayo clinic\textsuperscript{13} (Distal pole)</th>
<th>Prosser\textsuperscript{14} (Radiographic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuberosity fracture</td>
<td></td>
<td>Type A (Stable)</td>
<td>Distal (5%)</td>
<td>Type I Fractures of tuberosity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1 Tubercle</td>
<td>(Union rate 100%)</td>
<td>Type 2 The dorsal sulcus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A2 Incomplete</td>
<td></td>
<td>Type II Distal intra-articular</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Type III Osteochondral fracture</td>
</tr>
<tr>
<td>Waist fracture</td>
<td>Horizontal oblique</td>
<td>Type B (Unstable)</td>
<td>Middle (65%)</td>
<td>Type 1 The ‘surgical waist’</td>
</tr>
<tr>
<td></td>
<td>Transverse</td>
<td>B1 Oblique distal third</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2 Displaced</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vertical oblique (5%)</td>
<td>B4 Fracture dislocations</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delayed union 6 weeks after plaster</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type D</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D1 Fibrous nonunion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D2 Sclerotic Nonunion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D3 Nonunion with fixed DISI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximal pole fracture</td>
<td>Type B3</td>
<td>Proximal third</td>
<td>Proximal (30%)</td>
<td>Type 3 The proximal pole</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Union rate 64%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type D4</td>
<td>Nonunion with AVN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 1. Classification of scaphoid fractures in adults

<table>
<thead>
<tr>
<th>SITE AND TYPE OF FRACTURE</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal third*</td>
<td>10</td>
</tr>
<tr>
<td>Middle third</td>
<td>70</td>
</tr>
<tr>
<td>• Transverse</td>
<td>42</td>
</tr>
<tr>
<td>• Horizontal oblique</td>
<td>24.5</td>
</tr>
<tr>
<td>• Vertical oblique</td>
<td>3.5</td>
</tr>
<tr>
<td>Proximal third</td>
<td>20</td>
</tr>
</tbody>
</table>

*Distal third fracture, Middle third fracture (Transverse, Horizontal oblique, Vertical oblique), Proximal third fracture.

Location (Mayo):
  distal (tubercule+distal pole)
  middle (waist)-70-90%
  proximal pole
Orientation (Russe):
  transverse
  horizontal oblique
  vertical oblique
Anatomy, stability, chronicity (Herbert):
  undisplaced
  displaced or angulated
Russe classification of scaphoid fractures

Horizontal Oblique  Transverse  Vertical Oblique

Herbert’s classification of scaphoid fractures

**TYPE A: STABLE ACUTE FRACTURES**

- A1: Fracture of tubercle
- A2: Incomplete waist fracture

**TYPE B: UNSTABLE ACUTE FRACTURES**

- B1: Distal oblique fracture
- B2: Complete waist fracture
- B3: Proximal pole fracture
- B4: Transscaphoid perilunate fracture dislocation of carpus

Herbert’s classification

- Type C: delayed union (after 12 weeks)
- Type D: established non-union
  - D1- fibrous non-union
  - D2- pseudarthrosis (early deformity)
  - D3- sclerotic pseudarthrosis
    (advanced deformity)
  - D4- avascular necrosis of the prox.pole
Cooney, Dobyns and Linscheid

- **Undisplaced:** Stable, no displacement evident on any of the views.

- **Displaced:** Unstable
  
  More than 1 mm displacement on AP and oblique views, or
  
  More than 15 degrees lunocapitate angulation on lateral view, or
  
  More than 45 degrees scapholunate angulation
Some studies have demonstrated limited prognostic value and poor inter- and intraobserver reliability of scaphoid fracture classification schemes.

Take home messages

• These classifications are mainly useful in complimenting each other.
• However, the scaphoid fractures always need to be analysed independently based on their particularities.
Thank you for your attention!