



# Scaphoid Fractures and Carpal Instability – Radiographic Measures

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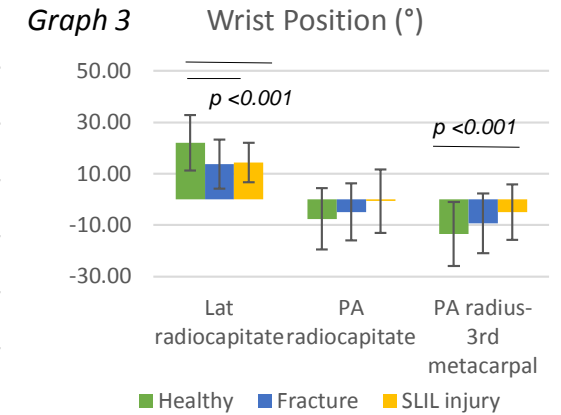
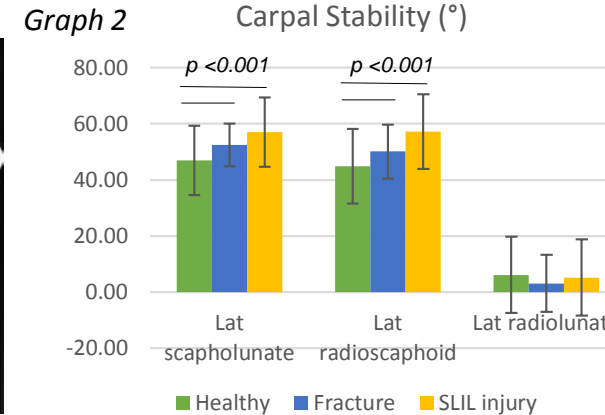
## Objectives

- Scaphoid fractures with signs of associated carpal instability are considered unstable fractures with elevated risk of nonunion [1]
- Scaphoid fracture displacement - extension and supination of the proximal fragment, no motion of the distal fragment [2], differing from the rotatory instability of the scapholunate ligament (SLIL) injury
- How reliable are the radiographic measures of instability?**
- Is wrist position a significant factor in this analysis?**

Our **hypothesis** - there is a correlation between wrist position and the presence of signs of carpal instability.

## Methods

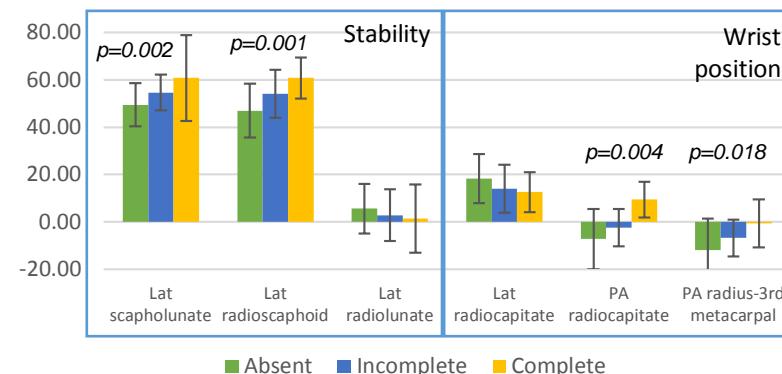
Wrist radiographs – PA and lateral, examined Patients with **scaphoid fractures** (under 6 weeks), **SLIL injuries** (no arthritis) and a **control group** (no pathology). **Measures of carpal instability** – scapholunate (SL), radioscaphoid (RS) and radiolunate (RL) angles on lateral views and cortical ring sign (CRS) on PA views [3]. An association was examined with **measures of wrist position** – radiocapitate (RC) and radius-3<sup>rd</sup> metacarpal (R3M) angles on PA views and radiocapitate (RC) angle on lateral views.



## Results

- We examined radiographs of **57 patients with fractures (31 waist fractures), 23 with SLIL injuries (6 static injuries) and 43 with no pathology.**
- Measures of wrist instability differed between the three groups (graphs 1, 2). A **complete ring sign** was associated with a **static SLIL injury** ( $p=0.025$ ).
- SL angle** differed between the healthy and the displaced body fracture and static SLIL injury groups ( $p<0.001$ ).
- RS angle** differed between the healthy and SLIL injury groups ( $p<0.001$ ).
- In the **study groups, wrist position was found to be in flexion** (lateral view RC angle) and **radial deviation** (PA view R3M angle) in comparison with the healthy group ( $p<0.001$  and  $p=0.18$ , respectively).
- A **ring sign** could be seen with **wrist radial deviation** (PA view RC and R3M angles) ( $p=0.003$  and  $p=0.003$ , respectively) and **wrist flexion** (lateral view RC) ( $p=0.024$ ), regardless study group. A **complete CRS was specifically associated with wrist radial deviation** (measured with the PA view RC angle) in comparison with absent or incomplete CRS ( $p=0.004$ ). The RS angle was correlated with the lateral RC and PA R3M angles ( $R=0.5$ ).

**Graph 1** Cortical ring sign, stability and wrist position (°)



## Conclusions

- Cortical ring sign, to differentiate pathology - significant if examining complete and incomplete rings; complete CRS associated with static SLIL injury.
- Wrist pathology - radiographs are taken when wrists are radially deviated and flexed – a position of reduced pain?
- Significant correlation between pathology, wrist position and signs of instability
- When utilizing different measures of carpal instability, the effect of wrist position must be considered.

[1] Linscheid et al, Traumatic Instability of the Wrist, JBJS-A 1972; [2] Schwartz et al, Three-Dimensional Analysis of Acute Scaphoid Fracture Displacement: Proximal Extension Deformity of the Scaphoid, JBJS-A 17; [3] Abe et al, The Clinical Significance of the Scaphoid Cortical Ring Sign: A Study of Normal Wrist X-rays, JHS-E 08