



Determining the Accuracy of Scaphoid Screw Position with Fluoroscopy and Computed Tomography

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Introduction

Longer screws positioned centrally within the scaphoid are biomechanically advantageous. Accurate measurement of screw length is critical: a screw that is too long can protrude into the joint, but one that is too short may not adequately fixate the fracture. The unique anatomy of the scaphoid makes intraoperative and postoperative imaging of the hardware challenging and can cause the surgeon to wonder if fracture fixation is adequate.

Methods

Cadaveric Study (N=10)

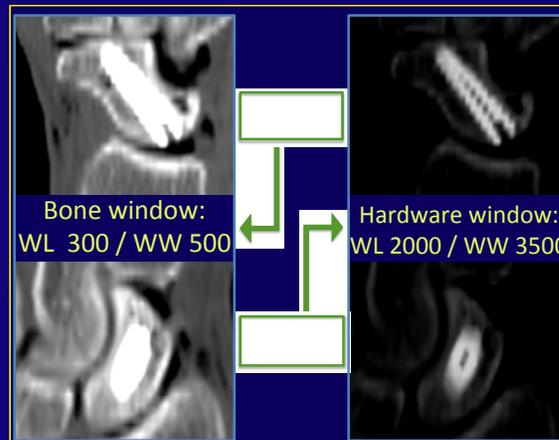
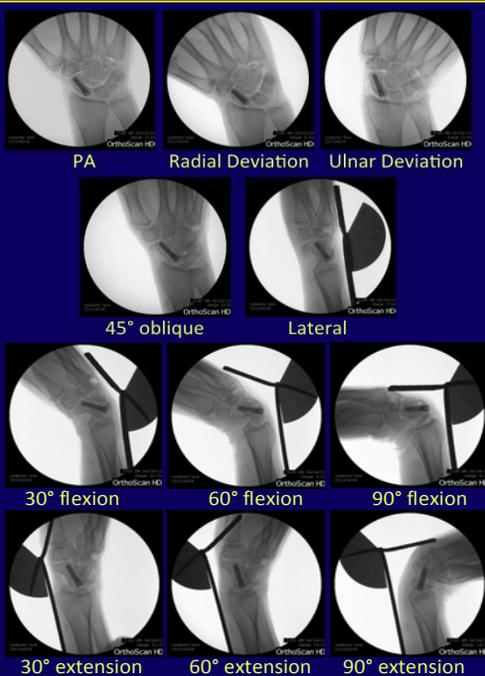
The distance between the end of a headless cannulated screw and both the distal and proximal aspects of the subchondral scaphoid bone were measured on:

- 1) Mini-fluoroscopy (XR)
- 2) Computed tomography (CT)
- 3) On the bisected scaphoid bone

On CT, the measurements were made using the standard bone window settings (WL 300/WL 500) and customized hardware window settings (WL 2,000/WL 3,500) to better approximate metal density.

Objectives

- 1) Determine if fluoroscopic and computed tomographic images accurately portray cannulated screw position within a scaphoid.
- 2) Determine the best viewing window for analyzing screw position on computed tomography.



Distal CT Measurements			
	Window	Mean Difference (mm)	P-value
Sagittal	Bone	-0.7	0.111
	Hardware	-0.4	
Coronal	Bone	-0.8	0.111
	Hardware	-0.7	
Proximal CT Measurements			
	Window	Mean Difference (mm)	P-value
Sagittal	Bone	-1.1	0.76
	Hardware	-0.9	
Coronal	Bone	-0.1	0.76
	Hardware	-0.05	

Results

- XR measurements tend to make the screw appear further from the cortex than it is (59% distally, 55% proximally)
- Distally on XR, for the PA plane only, the screw appears closer to the cortex (73%)
- CT measurements tend to make the screw appear closer to the cortex than it is (68%)
- CT is consistently more accurate than any one XR view (R=0.8-0.9 for CT, R=0.2-0.9 for XR)
- On CT, the hardware window is significantly better at analyzing screw position than the bone window in the sagittal plane

Conclusions

- No one XR image consistently predicts screw position.
- On CT, the WW/WL should be adjusted to better approximate metal density to ensure the screw size is not artificially inflated.