Scaphoid fractures: Diagnosis / Imaging

Technique and indications

Kolo Frank
**Scaphoid fracture imaging: why?**

- Of all carpal fractures **82-89%** concern **scaphoid fractures**
- No reliable clinical test to confirm the diagnosis of a scaphoid fracture

<table>
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<th>Pain when pressure on anat. snuffbox</th>
<th>Pain when axial pressure on 1st metacarpal</th>
<th>Pain when pressure on scaphoid tubercle</th>
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<tbody>
<tr>
<td><strong>Sensitivity</strong></td>
<td>100 %</td>
<td>100 %</td>
<td>100 %</td>
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<tr>
<td><strong>Specificity</strong></td>
<td>9 %</td>
<td>30 %</td>
<td>48 %</td>
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Scaphoid fracture imaging: conventional radiographs

- Posteroanterior view (PA), lateral view, semipronated oblique view, PA with ulnar deviation view

**Sensitivity:** 60-70%  
**Negative predictive value:** 74%

Dorsey et al. Cost-Effectiveness of immediate MRI versus traditional follow up for revealing radiographically occult scaphoid fracture; AJR 2001
Scaphoid fracture imaging: negative initial radiographs

Next step?

- Immobilization and radiographic follow-up? ⇄ Advanced imaging procedures?

Assuming the current standard of care (watchful immobilization) is applied, most patients with positive findings at clinical examination and negative radiographic results (≈75% by our review) will undergo needless casting (and possibly recasting), which compromises both lifestyle and productivity. Follow-up appointments additionally result in lost wage-earning hours (often a full day) or increased day-care expenses.
Occult scaphoid fractures: Bone scintigraphy? MDCT? MRI?

- Metanalysis / 26 studies included: sensitivity and specificity

**Bone scintigraphy**: 97% - 89%

**MRI**: 97% - 99%

**MDCT**: 93% - 99%

Limitations: 50% of CT studies did not report the time from injury to the imaging examination

Zhang-Gang Yin et al, Diagnosing Suspected Scaphoid Fractures, a systematic review and Meta-analysis, Clin Orthop Relat Res 2010
Clinically suspected of having scaphoid fractures

Normal initial radiographs

Radiographs obtained 6 weeks after trauma as the reference standard

Memarsadeghi et al, Occult scaphoid fractures: Comparison of Multidetector CT and MR Imaging, Radiology 2006
Bone marrow edema without a discrete line = Bone contusion= trabecular fracture

Occult scaphoid fractures: Bone scintigraphy? MDCT ? MRI?
Occult scaphoid fractures: Bone scintigraphy? MDCT? MRI?

- **Linear low signal intensity** = Fracture +/- cortical fracture
Occult scaphoid fractures

Suspected scaphoid fracture

X-ray

- Fracture
  - Displaced
  - Appeared nondisplaced
    - CT-scan
      - Displaced
      - Nondisplaced
  - Abnormal signal
    - MRI
      - Abnormal signal
    - Normal signal
      - No fracture
Occult scaphoid fractures: ultrasonography

Using cortical disruption and soft tissue abnormality: 100% sensitivity / 98% specificity

Hauger et al, AJR 2002