PREOPERATIVE DIGITAL RADIOGRAPHY IN DISPLACED INTRA-ARTICULAR CALCANEAL FRACTURES WITH AND WITHOUT COMPUTED-TOMOGRAPHY: COMPARISON OF POSTOPERATIVE RADIOGRAPHIC OUTCOMES USING NOVEL RADIOGRAPHIC SCORE

Chayanin Angthong*, Wirana Anngthong**, Thos Harnroongroj***, Ichiro Yoshimura****, Kazuki Kanazawa****, Tomonobu Hagio****, Akinori Takeyama****, Masatoshi Naito****, Thossart Harnroongroj***

*Department of Orthopaedic Surgery, Faculty of Medicine, Thammasat University, Pathum Thani, THAILAND
**Department of Radiology, Faculty of Medicine, HRH Princess Mahachakri Sirindhorn Medical Center, Nakhon Nayok, THAILAND
***Department of Orthopaedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, THAILAND
****Department of Orthopaedic Surgery, Fukuoka University Faculty of Medicine, Fukuoka, JAPAN
Preoperative Digital Radiography in Displaced Intra-articular Calcaneal Fractures with and without Computed-Tomography: Comparison of Postoperative Radiographic Outcomes using Novel Radiographic Score

Chayanin Angthong, M.D.

My disclosure is in the Final AOFAS Program Book. I have no potential conflicts with this presentation.
Introduction

• Computed tomography (CT) scans are commonly used in fracture evaluation for calcaneus fractures*.
• However, after the innovatively Digital Radiograph (DR) was developed to evaluate fracture primarily, little is known about the additional advantages of CT in terms of treatment-guidance and its prognostic value.
• This study is a comparison of postoperative radiographic outcomes between patients who obtained preoperative DR with and without supplementary CT.

*Ogawa BK, et al. Foot Ankle Inter. 2009
Patients & Methods

- **Timing**: During 2008-2011
- **Population & Intervention**: All 36 patients, with displaced intra-articular calcaneal fracture, were reviewed and divided into two groups.
  1. Group I: 17 patients who obtained preoperative DR (anteroposterior, lateral, axial, oblique and/or Broden’s views of injured foot) with supplementary CT (CT-group)
  2. Group II: 19 patients who obtained preoperative DR as above without supplementary CT (Non-CT group)
- **Comparison**: Data between CT-group and Non-CT group
- **Baseline data & Outcomes**:
  1. Patient demographics, fracture cause, and treatment-procedure
  2. Preoperative and postoperative Bohler’s angles
  3. Fracture classifications were recorded according to Essex-Lopresti system with and without Sanders system in group I and II respectively.
  4. Postoperative data: radiographic outcomes via “novel radiographic score”

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Scores</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracture union</td>
<td></td>
<td>-</td>
<td>Abnormal</td>
<td>Possibly abnormal</td>
<td>Normal</td>
</tr>
<tr>
<td>Quality of reduction</td>
<td></td>
<td>-</td>
<td>Poor (intra-articular step/gap &gt;3 mm)</td>
<td>Fair (step/gap 2-3 mm)</td>
<td>Good (step/gap &lt; 2mm)</td>
</tr>
<tr>
<td>Bohler’s angles</td>
<td>&lt; 0°</td>
<td>0-9°</td>
<td>10-19°</td>
<td>20-40°</td>
<td></td>
</tr>
<tr>
<td>Subtalar arthritic change</td>
<td>-</td>
<td>Abnormal</td>
<td>Possibly abnormal</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

Total scores were graded as excellent (11-12 points), good (9-10 points), fair (6-8 points), and poor (< 6 points).
Results (1)

Baseline Data

- Timing:
  1. Mean follow-up time: 17.5 +/- 9.7 months.
  2. Mean age: CT-group, 49.7 years; Non-CT group, 37.1 years ($p = 0.002$).
- There were no significant differences between the two groups in terms of gender, side, fracture causes including number of patients in these parameters (Chart 1)
  1. Essex-Lopresti classification: joint depression vs tongue type ($p=0.559$)
  2. Treatment procedures: open reduction and internal fixation (ORIF) vs percutaneous fixation ($p=0.102$),
  3. Mean preoperative Bohler’s angle: CT-group = 2.1 +/- 18.8° vs Non-CT group II = 5.1 +/- 9.6° ($p=0.55$).
Results (2): Chart 1

- **Treatment**
  - ORIF
  - Percutaneous

- **Essex-Lopresti**
  - Joint depression

- **Side**
  - Left
  - Right

- **Gender**
  - Male
  - Female

---

*P > 0.05*
Results (3)

• Postoperative outcomes
  1. Novel radiographic score: non-difference between 2 groups ($p>0.05$)
     • CT-group: mean scores=11.06 (grading--good, 29.4%; excellent; 70.6%)
     • Non-CT group: mean scores=10.37 (grading--poor, 5.3%; fair, 5.3%; good, 26.3%; excellent, 63.2%)
  2. Mean Bohler’s angle: non-difference between 2 groups ($p=0.807$)
     • CT-group: mean value=22.86 degree
     • Non-CT group: mean value=23.63 degree
  3. Fracture nonunion: 0% in both CT-group and Non-CT group
  4. Subtalar arthritis: CT-group (17.6%) vs Non-CT group (15.8%); $p=0.881$
Discussion & Conclusion

• Based on the result of the present study, there were no differences of the radiographic outcome between the two groups.
• CT did not provide any advantages in addition to standard DR in terms of the prediction of postoperative radiographic outcomes.
• This phenomenon might be caused of the improvement of DR in terms of quality of resolution and interpretation techniques.
• Further study is necessary to determine the additional advantages from CT, in terms of the clinical outcome, compared with solely preoperative DR.
References