The predicting factor for avascular necrosis after talus fracture — the study based on CT findings —

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< H. Ikezawa >

My disclosure is in the Final AOFAS Mobile App.
I have no potential conflicts with this presentation.
Necrosis cannot be identified directly by a conventional fracture classification.
Purpose

We investigated fracture lines of the talus with CT to determine the association between fracture of the talus and the occurrence of necrosis.
Subjects and Methods (2003~2013)

- 27 cases, 27 feet
- Male 20 feet, Female 7 feet
- Age Avg. 46.3 years (15~80 years)
- Neck fracture 12, Body fracture 15

Imaging
- Radiograph, CT, fracture lines
- Inokuchi-Ogawa classification
- MRI, necrosis

After talus fracture:
- Necrosis (+) 9 feet
- Necrosis (-) 18 feet
6 fracture lines between each point

Talus inferior site
  a) the sulcus tali
  b) the sinus tarsi
  c) between the lateral process and the lateral tubercle
  d) the medial tubercle

(photographs by T. Albrecht, DGPh, Dresden, Germany).
Results (1) necrosis (−) group

(exclusion of 2 unclassifiable cases)

1 fracture line
(N=8)

2 fracture lines
(N=7)

3 fracture lines
(N=1)
# Results (2) Necrosis (+) Group

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>Sex</th>
<th>Fracture lines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>a-b</td>
</tr>
<tr>
<td>1</td>
<td>55</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>5</td>
<td>78</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>6</td>
<td>63</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>7</td>
<td>15</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>8</td>
<td>59</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>14</td>
<td>52</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>23</td>
<td>66</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>24</td>
<td>55</td>
<td>F</td>
<td>O</td>
</tr>
<tr>
<td>25</td>
<td>36</td>
<td>M</td>
<td>O</td>
</tr>
</tbody>
</table>

Among the lines connecting a-b, a-c, and b-d, fracture was observed in more than 2 lines in all cases.
## Discussion

Past report: necrosis rate post-talus fracture

<table>
<thead>
<tr>
<th>Neck fracture</th>
<th>Hawkins</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>AVN(%)</td>
<td>0–24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Body fracture</th>
<th>Non-displaced</th>
<th>displaced</th>
</tr>
</thead>
<tbody>
<tr>
<td>AVN(%)</td>
<td>5–44</td>
<td>50</td>
</tr>
</tbody>
</table>

Metzger Mj et al J, Foot Ankle Surg 1999;38:154-162
Kuner EH et al Talus fractures Springer;1993:72-85
Blood supply of the talus

- Mulfinger et al. (J.B.J.S1970 52B:160-167)
  Artery
  Tarsal canal
  Tarsal sinus
  Dorsalis pedis
- Johannes et al. (Surg Radiol Anat 2014 36:487-494)
  The microvascular anatomy of the talus
  The highest amount and density of nutritive foramina in the sulcus tali

![Diagram of blood supply to the talus](image-url)
Relationship fracture lines and necrosis

In this series

Fracture lines connecting a-b, a-c, and b-d interrupt major blood routes.

Talus fracture more than 2 fracture lines were high frequency to develop avascular necrosis.

Fracture lines may predict the occurrence of necrosis

(Johannes et al. Surg Radiol Anat 2014 36:487-494)
Conclusion

• We designed new and simple method for avascular necrosis with Inokuchi-Ogawa classification and CT findings.

• Talus fracture including more than 2 lines, a-b, a-c, b-d, cause high frequency avascular necrosis.
References

• Metzger Mj et al. Talar neck fractures and rates of avascular necrosis J, Foot Ankle Surg 1999;38:154-162
• Kuner EH et al. Talus fractures Springer;1993:72-85
• Mulfinger et al. The blood supply of the talus. J.B.J.S 1970 52B:160-167
• Stefan et al. Talar neck and body fractures.Injury,Int . J.Care Injured 2009 40:120-135