Correlation Between Talar Tilt Angle and Hindfoot Varus In Medial Ankle OA

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Ki Sun Sung, MD, PhD

- My disclosure is in the Final AOFAS Mobile App.
- I have no potential conflicts with this presentation
Introduction

• Two Types of Medial OA

Varus tilt vs medial translation

✓ Varus tilt and medial translation is important determining factors in Supramalleolar osteotomy (Lee et al. JBJS, 2011)
Hypothesis and Purpose

• Hindfoot varus compensation
  ➔ talar tilt or medial translation?

• Purpose
  ➔ To identify about correlation between hindfoot alignment and talar tilt
Material and Method

• Medial osteoarthritis of ankle cases
  - From May 2006 to Feb 2015
  - Takakura stage 1-3b
  - 97 patients, 126 cases

• Demographics
  - Age : 62.9 (17-81)
  - M/F : 39/58
  - Rt./Lt. : 66/60
1. Tibio-talar angle: ankle varus (alignment of ankle)
2. TAS (tibia anterior surface angle)
3. Talar tilt angle
4. Hindfoot alignment angle
Measurement and Evaluation

• Measurement
  - tibio-talar angle / talar tilt / hindfoot alignment

• Divided into 4 groups
  - tibiotalar angle of 60°–100°, per 10°
  - Divided into 2 subgroups depend on the median talar tilt angle
  - Identify the differences in the hindfoot alignment between the subgroups

• All radiographs measured by two observers
  - To decrease the interobserver variability
## Result

<table>
<thead>
<tr>
<th></th>
<th>Mean(range)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tibio-talar angle</strong></td>
<td>81.9° (66.3~95)</td>
</tr>
<tr>
<td><strong>TAS</strong></td>
<td>87.0° (79.8~97)</td>
</tr>
<tr>
<td><strong>Talar tilt</strong></td>
<td>5.14° (0.01~20.1)</td>
</tr>
<tr>
<td><strong>Hindfoot alignment</strong></td>
<td>7.36° (-14.7~37.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
<th>Tibiotalar angle</th>
<th>N</th>
<th>subgroup</th>
<th>Talar tilt</th>
<th>N</th>
<th>Correlation between talar tilt and hindfoot alignment (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100°</td>
<td>6</td>
<td>A1</td>
<td>&lt;0.4°</td>
<td>3</td>
<td>0.6625</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A2</td>
<td>≥0.4°</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>80-90°</td>
<td>81</td>
<td>B1</td>
<td>&lt;2.1°</td>
<td>39</td>
<td>0.3692</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B2</td>
<td>≥2.1°</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>70-80°</td>
<td>34</td>
<td>C1</td>
<td>&lt;9.5°</td>
<td>17</td>
<td>0.0072</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C2</td>
<td>≥9.5°</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>60-70°</td>
<td>5</td>
<td>D1</td>
<td>&lt;17°</td>
<td>2</td>
<td>0.7728</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>D2</td>
<td>≥17°</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Result

- **Tibiotalar angle**
  - **strong correlation with talar tilt angle** \( r = -0.845 \) (A)
  - **weak correlation with hindfoot alignment angle** \( r = -0.595 \) (B)

- **Talar tilt angle**
  - **weak correlation with hindfoot alignment angle** \( r = 0.581 \) (C)
Discussion

• **Peritalar instability (Hintermann et al. FAI 2012)**  
  - leads to talar rotation and translation on the calcaneus  
  - Occur 3-dimensional positional change and various malpositions

• **Compensation of subtalar joint (Hayashi et al. FAI 2008)**  
  - compensation of varus talar tilt -> hindfoot valgus  
  - Uncompensation of varus talar tilt -> hindfoot varus

✓ Compensated hindfoot valgus  
  - transmit a *translational force* to talus

✓ Uncompensated hindfoot varus  
  - transmit a *rotational force* to talus

➔ result in different degree of talar tilt
Summary and Conclusion

• Tibio-talar angle of 70-80° varus ankle (subgroup with talar tilt angle > 9.5°)
  ➔ Significantly more hindfoot varus
  ➔ Definite correlation between talar tilt angle and hindfoot alignment angle in certain degree of varus ankle OA

• No significant correlation between tibio-talar angle and hindfoot alignment angle

• Clinical relevance in determining the method of ankle osteotomy surgery
References


