Reoperations after total ankle arthroplasty

Two to nine year follow-up of 192 consecutive cases

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

Total Ankle Arthroplasty (TAA): as a promising alternative to ankle arthrodesis

<table>
<thead>
<tr>
<th>Study</th>
<th>Type of prosthesis</th>
<th>Duration (mo)</th>
<th>Survival rate (%)</th>
<th>Revision (%)</th>
<th>Osteolysis (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlsson¹</td>
<td>STAR</td>
<td>60</td>
<td>94</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Hintermann²</td>
<td>Hintegra</td>
<td>36</td>
<td>91</td>
<td>8</td>
<td>NA</td>
</tr>
<tr>
<td>Spirt³</td>
<td>Agility</td>
<td>108</td>
<td>80</td>
<td>20</td>
<td>42</td>
</tr>
<tr>
<td>Doets⁴</td>
<td>LCS, BP</td>
<td>96</td>
<td>84</td>
<td>16</td>
<td>45</td>
</tr>
<tr>
<td>Bonnin⁵</td>
<td>Salto</td>
<td>35</td>
<td>94</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Even though, promising clinical results, high reoperation rate is still of concern.

In this study, we analyzed the incidence and characteristics of reoperations including revisions after 192 Hintegra TAA.
Materials and Methods

- May 2004~July 2012
- 224 primary TAAs
  - 207 consecutive patients
  - using Hintegra® (Newdeal SA, Lyon, France) system
- 32 ankles were excluded (follow up less than 2 years)
- 192 ankles (175 patients) have been studied.
- Mean F/U : 61.6 months (range: 24 - 118)

Radiological Evaluations
- All radiographs were taken with the aid fluoroscopy to obtain weight-bearing standarized and true AP and lateral view
- Helical CT scan for progressive osteolytic lesion
- Serial follow-up 6 weeks, 3 and 6 months, 1 year, annually
Materials and Methods

Positioning of component

- Tibial Component Loosening
  - A change of the $\alpha$ angle $> 2^\circ$
  - A change of the $\beta$ angle $> 2^\circ$
  - Progressive radiolucent line $> 2\text{mm}$

- Talar Component Loosening
  - A change of the $\gamma$ angle $> 5^\circ$
  - A change of the distance $a > 5\text{mm}$
  - A change of the distance $b > 5\text{mm}$

Osteolysis

- Demarcated nonlinear lytic lesion $\geq 2\text{ mm in width}$

Schutte BG, FAI, 2008;29:124-7
# Results

## Characteristics by etiology

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>OA 83/192 (43%)</th>
<th>Traumatic OA 91/192 (48%)</th>
<th>RA 18/192 (19%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male:female ratio</td>
<td>41:42</td>
<td>50:41</td>
<td>3:15</td>
<td>0.012</td>
</tr>
<tr>
<td>Mean (SD) age (years)</td>
<td>64.7 (7.2)</td>
<td>62.6 (8.4)</td>
<td>56.8 (9.8)</td>
<td>0.003</td>
</tr>
<tr>
<td>Mean (SD) body mass index (kg/m²)</td>
<td>25.61 (3.05)</td>
<td>26.44 (3.14)</td>
<td>22.75 (2.88)</td>
<td>0.010</td>
</tr>
<tr>
<td>Overall reoperation (%)</td>
<td>19</td>
<td>23</td>
<td>5</td>
<td>0.971</td>
</tr>
<tr>
<td>Major revision</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>0.764</td>
</tr>
<tr>
<td>Bone graft</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>0.696</td>
</tr>
<tr>
<td>Arthroscopic debridement</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>0.086</td>
</tr>
<tr>
<td>Additional procedure</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>0.810</td>
</tr>
</tbody>
</table>

### Radiologic parameters

- **Preoperative TAS angle (°)**: 6.6 (1.7), 6.6 (1.7), 6.8 (1.2)  
  p-value: 0.163
- **Postoperative α angle (°)**: 87.8 (2.1), 87.7 (2.1), 87.7 (1.2)  
  p-value: 0.943
- **Postoperative β angle (°)**: 85.7 (2.5), 86.1 (3.1), 85.3 (2.9)  
  p-value: 0.404
- **Postoperative γ angle (°)**: 11.3 (5.1), 11.2 (5.1), 10.2 (4.6)  
  p-value: 0.744

Patients with RA were relatively young and lean.

No significant differences in reoperations & radiologic parameters.
## Results

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Revision</strong></td>
<td>Conversion to arthrodesis</td>
<td>5</td>
</tr>
<tr>
<td>4% (8/192)</td>
<td>(d/t Talar subsidence/Deep infection: 4/1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tibial component change</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(d/t tibial side osteolysis)</td>
<td></td>
</tr>
<tr>
<td><strong>Minor Revision</strong></td>
<td>Bone graft (d/t osteolysis, tibia/talus/both: 11/2/4)</td>
<td>17</td>
</tr>
<tr>
<td>20.3% (39/192)</td>
<td>Arthroscopic debridement (d/t soft tissue impingement)</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Ligament rebalancing</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>(Brostrom op./PL transfer/PTT lengthening /Medial release/FDL tenodesis..)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corrective calcaneal osteotomy</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(d/t remnant heel valgus/varus malalignment)</td>
<td></td>
</tr>
</tbody>
</table>

Overall reoperations: 47/192

→ **24.4% (47/192)** reoperation rate after TAA
Results

Major revision 4% (8/192)

- Component removal & fusion
  - 5 ankles

- Talar subsidence
  - 4 cases

- Deep infection
  - 1 case

- Component change
  - Tibia component change
    - 3 ankles
    - 3 cases

- Time to revision: 34.2 mo (6-70)

- F/U after revision: 44.3 mo (6-94)
Results

Survival analysis

End point: Major & minor revision

Mean survival time
89.4 ± 3.4 mo
(95% CI, 82.7 - 96.1 mo)
Survival rate at 5 yrs- 71%

End point: Major revision (component change, fusion)

Mean survival time
113.5 ± 1.5 mo
(95% CI, 110.4 - 116.5 mo)
Survival rate at 5 yrs- 94%
Discussion

Largest study by the developer group
- 61(8.4%) revisions out of 722 ankles
- Survival rate was 91% at 112 months
  - Hintermann et al. JBJS 2013

Our result after Hintegra TAA
- 4% (8/192) underwent major revisions
- Survival rate was 95% after five years
- Close f/u, early detection of osteolysis & management
  - Yoon HS et al. FAI 2014

Most of the studies lacked details regarding location of the failure
- 20 revisions in 109 STAR implants
  - 16 arthrodesis
- 7 (43.8%) were the result of isolated failure of the talar side aseptic loosening
  - Carlsson A et al. Orthopade. 2006

Our result after Hintegra TAA
- 8 revisions in 192 Hintegra implants – 5 TTC fusion
- 4 (80%) were the result of talar subsidence

→ Maintenance of TAA depends on viability of talar side
Total ankle arthroplasty is **successful operation** in terms of **longevity**. If proper minor revisions take place at the right time **favorable survival rate** could be achieved.

Chance of maintaining TAA decreases when **subsidence** and **osteolysis** around **talar component** occurs.


6. Rodriguez, D; Bevernage, BD; Maldague, P; et al.: Medium term follow-up of the AES ankle prosthesis: High rate of asymptomatic osteolysis. Foot Ankle Surg. 16(2):54-60, 2010.


