Mid-Term Outcomes of INBONE I Total Ankle Arthroplasty with Deformity Analysis

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Disclosures

- Disclosures may be found on the AOFAS meeting app
Introduction

• End-stage arthritis of the ankle is a debilitating condition
• Ankle joint replacement has become more popular

• INBONE I was a commonly used prosthesis\textsuperscript{1,2}
  – Touted for severe coronal plane deformity
• Though replaced by INBONE II, it is important to report on the outcomes
  – To help inform surgeons and patients outcome expectations
  – As much of the overall design remains the same in the INBONE II.\textsuperscript{3}

• Reviewed our series of INBONE I
  – minimum of 4–10-years of follow up
Methods and Materials

• INBONE I prosthesis
  – Surgeons with extensive experience in TAA
  – Implants were placed “off label” without use of cement
  – Standard contraindications to ankle arthroplasty

• Analyzed the data
  – Between pre-op and the most recent follow-up
  – Complications, reoperations, and additional surgeries
  – Failure: defined as undergoing revision for exchange or removal of the metallic component for any reason

• Grouped according to coronal plane tibiotalar alignment
  >10 degrees vs <10 degrees
Results

- May 2007 - September 2011
- **149 ankles**, in 142 patients, had minimum 4 year clinical and radiographic follow-up
  - 162 INBONE I prostheses implanted in 155 patients
  - Revisions from a different total ankle prosthesis or takedown of an ankle fusion were excluded from the study (7)

- Demographics
  - Average age: 63.2
  - Average BMI: 29.3 kg/m²
  - 96 men, 53 women
  - 89 right-sided surgeries, 60 left-sided
  - 6 active smokers (4.2%)
  - 14 type II diabetic patients (9.9%)
  - Primary diagnosis: post-traumatic arthritis (65%)

- Follow-up
  - 48-113 months
  - Average: 71 months (**5.9 years**)
Results

- Significant improvement in all patient outcome scores

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Preop</th>
<th>Final Follow up</th>
<th>P Value</th>
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</thead>
<tbody>
<tr>
<td>VAS Pain</td>
<td>71.06 +/- 21.57</td>
<td>14.1 +/- 20.63</td>
<td>&lt;0.001</td>
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<td>AOFAS</td>
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<tr>
<td>Total</td>
<td>40.05 +/- 16.71</td>
<td>76.17 +/- 14.44</td>
<td>&lt;0.001</td>
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<tr>
<td>Pain</td>
<td>10.79 +/- 10.59</td>
<td>30.37 +/- 10.61</td>
<td>&lt;0.001</td>
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<tr>
<td>Function</td>
<td>23.35 +/- 8.8</td>
<td>36.0 +/- 6.73</td>
<td>&lt;0.001</td>
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<tr>
<td>Alignment</td>
<td>5.86 +/- 3.77</td>
<td>9.41 +/- 1.62</td>
<td>&lt;0.001</td>
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<td>SF-36</td>
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<tr>
<td>Total</td>
<td>51.87 +/- 17.83</td>
<td>71.91 +/- 18.78</td>
<td>&lt;0.001</td>
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<tr>
<td>Physical</td>
<td>42.18 +/- 16.21</td>
<td>65.62 +/- 20.16</td>
<td>&lt;0.001</td>
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<td>Mental</td>
<td>65.01 +/- 20.58</td>
<td>75.59 +/- 17.68</td>
<td>&lt;0.001</td>
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<td>SMFA</td>
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<tr>
<td>Function</td>
<td>35.54 +/- 12.37</td>
<td>16.0 +/- 14.20</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Bother</td>
<td>40.86 +/- 18.35</td>
<td>18.52 +/- 17.44</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

- 32 patients (21.5%) had 35 additional surgeries
  - Impingement (20)
  - Cysts (4)
  - Malalignment/instability (4)
  - Infection (3)
  - Achilles contracture (3)
  - Subtalar arthrodesis (1)
Results

• 14 implant failures
  – Survivorship of 90.6% (135/149)
• Reasons for failure
  – Cysts/loosening (7)
  – Subsidence (4)
  – Fractured component (1)
  – Impingement (1)
  – Infection (1)
• Revision operations
  – Talar prosthesis revision only (6)
  – Tibial and talar revision (3)
  – Tibiotalocalcaneal arthrodesis (4)
  – Below-knee amputation (1)
Results

- Pre-operative coronal plane deformity analysis:
  - 72 patients (48.3%) with >10 degrees varus or valgus
  - 78 patients (51.7%) with <10 degrees deformity

- No difference:
  - Demographics
  - Patient outcome scores
  - Revision rates

- Statistically significant difference in reoperation rates (p=0.039)
  - 22.2% in patients with >10 degrees deformity vs 37.7% in those without
Discussion

- 4 revisions (2.7% of all cases) occurred secondary to talar subsidence
  - Due to an osteolytic process or avascular changes within the talar body?
  - Instruments through the subtalar joint may risk injury to the extrasosseous and intraosseous talar vascular network\(^4\)
- 6 mm reamer
  - Passed through the calcaneus and talus, to facilitate the modular intramedullary stem
  - Unique to the design of INBONE, and possibly to its complications

\[\text{Images of ankle implants at different time points: 6 weeks, 3 months, 6 months, 1 year, 2 years, 3 years}\]
Discussion

• Chosen for pre-existing coronal plane deformity
  – High percentage (48.3%) of cases having >10 degrees pre-operative varus or valgus
  – “More challenging” cases: had equal pain relief, function, and need for revision surgery
    • Fewer additional surgeries in high pre-operative deformity (p=0.039)

• Take aways
  – TAA is a highly successful option to correct coronal plane deformity\textsuperscript{5-16}
  – Highlights the high durability and survivorship of the INBONE prosthesis despite these “more challenging” aspect of 48.3% of the cases
  – Question the presumed predisposition to coronal plane instability of the INBONE I saddle-shaped talar design
Discussion

• The longest and largest follow-up of the INBONE I prosthesis
  – Significant improvement in pain scores, overall function, and patient-reported outcomes

• Implant survival rate was **90.7% at a mean of 5.9 years**

• Despite the presumed shortcomings of the INBONE I's saddle-shaped talar design, this operation showed promising results, with or without deformity, at mid-term follow-up
References


