Salvage of Infected INBONE Total Ankle Replacement

Brent Roster, MD and George Lian, MD
Salvage of Infected INBONE Total Ankle Replacement

Brent Roster, MD

My disclosure is in the Final AOFAS Mobile App.

I have no potential conflicts with this presentation.
Introduction

- Reported rates of infection after total ankle replacement (TAR) requiring surgical I&D, component removal/exchange, or revision range from 0-8.6% \(^1-5,7,8\)

- Traditional two-stage revision procedures can result in significant bone loss, making reconstruction difficult or impossible

- The INBONE is a fixed-bearing TAR which utilizes a modular intramedullary tibial stem

- Removal of a well-fixed INBONE tibial stem can be difficult and can result in significant morbidity
Biofilms and Periprosthetic Joint Infection

- Bacterial biofilm formation on orthopaedic implants confers resistance to both host defense and antimicrobial agents.\(^9\)
- 2-stage revision with removal of all components is therefore most commonly successful.\(^5,9\)

- Lombardi et al: 89% success with partial 2-stage revision of infected total hip arthroplasty (well-fixed femoral stems retained) at an average of 4 years.\(^6\)

- Kessler et al reported a 66.7% success rate at an average of 2 years in treatment of infected TAR with retention of one or both components.\(^5\)
Clinical question:

- Can patients with an infected INBONE total ankle replacement AND a well-fixed tibial stem be successfully treated with partial 2-stage revision?
- Can well-fixed tibial stem components be retained?

Study Design:

- Retrospective review of four consecutive patients with an infected INBONE total ankle replacement with at least 2 year follow-up after partial 2-stage revision
Methods

- Well-fixed tibial stem components were left in-situ
- All patients were treated with surgical I&D, removal of polyethylene, talar, and tibial tray components
- Intra-operative cultures were obtained, and antibiotic management was guided by the infectious disease service
- Antibiotic beads and antibiotic cement spacers were placed
- TAR was re-implanted at an average of 3.75 months s/p explant and spacer placement after being off antibiotics for at least 6 weeks
- Clinical exam, radiographs and inflammatory markers checked at most recent follow-up (average 26.5 months status post re-implantation)
# Results: Demographics and Risk Factors

<table>
<thead>
<tr>
<th>Patient</th>
<th>Gender</th>
<th>Age</th>
<th>Initial Diagnosis</th>
<th>Risk Factors for Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>70</td>
<td>Primary OA</td>
<td>DM; debridement and synovectomy for impingement after TAR</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>71</td>
<td>Post-traumatic OA</td>
<td>None identified</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>49</td>
<td>Post-traumatic OA</td>
<td>Hepatitis C; history of open pilon fracture treated with ORIF and subsequent HWR</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>59</td>
<td>Post-traumatic OA</td>
<td>Prior foot surgery; debridement and synovectomy for impingement after TAR</td>
</tr>
</tbody>
</table>

OA = osteoarthritis; DM = diabetes mellitus; ORIF = open reduction internal fixation; HWR = hardware removal; TAR = total ankle replacement
Results: Infectious Characteristics

<table>
<thead>
<tr>
<th>Pt</th>
<th>Time to Explant (Months)</th>
<th>Pre-op labs</th>
<th>Organism</th>
<th>Antibiotic</th>
<th>Duration of Abx therapy</th>
<th>Time to re-implantation (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>41</td>
<td>CRP 277</td>
<td>Alpha-hemolytic Strep</td>
<td>IV daptomycin</td>
<td>6 weeks</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>43</td>
<td>WBC 9.2, ESR 108</td>
<td>Propionibacterium</td>
<td>PO rifampin &amp; minocycline</td>
<td>1 year</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>39</td>
<td>CRP 0.8, ESR 31, WBC 8.1</td>
<td>Pseudomonas aeruginosa; GBS</td>
<td>cefepime</td>
<td>6 weeks</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>ESR 37, CRP 56.9, WBC 8.6</td>
<td>MSSA</td>
<td>nafcillin</td>
<td>6 weeks</td>
<td>5</td>
</tr>
</tbody>
</table>

Avg = 39

| Avg = 3.75 |

CRP = C reactive protein, mg/L, normal 0-9; WBC = white blood cell count, K/uL, normal = 4-11; ESR = erythrocyte sedimentation rate, mm/hr, normal 0-20; GBS = group B Streptococcus; MSSA = methicillin sensitive Staphylococcus aureus
## Results: Most Recent Follow-up

<table>
<thead>
<tr>
<th>Pt</th>
<th>F/u after re-implantation (months)</th>
<th>ROM</th>
<th>Narcotics?</th>
<th>Clinical signs of infection at ankle?</th>
<th>Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>34</td>
<td>35</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>24</td>
<td>22</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>24</td>
<td>25</td>
<td>no</td>
<td>no</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>24</td>
<td>30</td>
<td>no</td>
<td>no ***</td>
<td></td>
</tr>
<tr>
<td>Avg = 26.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** At most recent f/u, Patient #4 had a pressure wound over the contralateral ankle and infected abdominal hernia mesh after bowel rupture during colonoscopy with resultant colostomy; operative ankle was benign with no signs of infection.
Pre-op to Re-Implantation

Pre-op

After I&D, poly and talar component removal and placement of antibiotic cement spacer

24 months after re-implantation
Discussion/Conclusion

- 4/4 patients treated with this approach had functional revision TARs at an average of 26.5 months follow-up.
- 4/4 had no clinical signs of infection of their TAR.
- 1/4 had elevated inflammatory markers at most recent follow-up, with an explanation other than their TAR.
- Conclusion: In this small series of 4 patients, all were successfully treated with partial 2-stage revision for infection with retention of the well-fixed INBONE tibial components with at least 2 years follow-up.
References


