Outcomes Associated with the use of Porous Titanium Wedges in Foot & Ankle Reconstruction

Michael Matthew DPM; Michael Sganga DPM; Emily A. Cook DPM, MPH, FACFAS; Jeremy Cook, DPM, MPH, FACFAS; Philip Basile DPM, FACFAS

Statement of Purpose
The primary aim for this review was to evaluate the safety profile and complications associated with the use of porous titanium wedges in foot and ankle reconstruction.

Literature Review
Reconstructive procedures on the foot and ankle can be complicated by the requirement for precise reconstruction to restore normal function and structure. Defects of the foot and ankle can result from a variety of causes, including trauma, infection, degenerative disease, and congenital abnormalities. Treatment options may include surgical reconstruction with autograft, allograft, or synthetic substances.

Autografts are ideal because they are histocompatible with the recipient site, but they are limited by donor site morbidity, availability, and size. Allografts are histocompatible but have the potential for transmission of disease. Synthetic substances have the advantage of unlimited availability and can be sterilized, but they are limited in their ability to maintain normal anatomy and function.

Titanium is a biocompatible material that has been used in various medical applications due to its superior mechanical properties and corrosion resistance. Porous titanium, in particular, has gained attention due to its ability to promote osseointegration, where bone ingrowth occurs within the porous struts of the implant.

The use of porous titanium as an implant material has been shown to provide several advantages over traditional grafting methods. Porous titanium has a higher porosity compared to traditional bone grafts, allowing for improved bone ingrowth. Additionally, it has a more biocompatible surface that can reduce inflammatory reactions compared to tantalum.

Methods
- **Study Design**: Retrospective Case Series
- **Conflict of Interest**: Wright Medical Technology (PB)
- **Population**: N = 31 patients; 43 feet; 62 Total Porous Titanium Wedges; Mean 26.1 month follow up (range 10 to 77 months)
- **Inclusion Criteria**: All patients who underwent implantation of porous titanium wedges
- **Exclusion Criteria**: None
- **Inclusion Criteria**: All patients who underwent implantation of porous titanium wedges
- **Exclusion Criteria**: None
- **Population**: N = 31 patients; 43 feet; 62 Total Porous Titanium Wedges; Mean 26.1 month follow up (range 10 to 77 months)

Results
- **Primary and Secondary Outcomes**:
  - **Complication Rates**: Minor Complications: N=15; 30.7%; Major Complications: N=5; 9.8%
  - **Overall Complications**: N=20; 38.2%

Procedure: Complex Lower Extremity Deformity Correction with Utilization of Porous Titanium Wedges

Table 1: Demographics

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>31</td>
</tr>
<tr>
<td>Feet</td>
<td>43</td>
</tr>
<tr>
<td>Total 62</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Complications

<table>
<thead>
<tr>
<th>Complication Type</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Infections</td>
<td>14 (29.2%)</td>
</tr>
<tr>
<td>Minor Complications</td>
<td>10 (23.2%)</td>
</tr>
<tr>
<td>Major Complications</td>
<td>5 (10.2%)</td>
</tr>
<tr>
<td>Complications Directly Attributed to Titanium Wedges</td>
<td>0</td>
</tr>
</tbody>
</table>

Analysis & Discussion
Our results supported the hypothesis that porous titanium wedges had lower incidence of infection and complications when compared to historical literature. We found that none of our porous titanium wedges required explantation over a follow-up range of 10 to 77 months. There were no graft rejections and no pain associated with the grafts. There were three instances of superficial infections which resolved uneventfully with oral antibiotics. Two patients who underwent CCA/distraction arthroplasty experienced fourth and fifth metatarsal stress fractures from lateral column overload. This suggests our experience with property sized grafts is critical and correlation is quite commonly practiced with allografts is not recommended for porous titanium use. We found a 23.2% incidence of minor complications, and no major complications were appreciated.

These results are consistent with historical controls. No cases of adverse outcomes from porous tantalum harvest were noted for either the foot or ankle. Porous tantalum was associated with traditional gluteal grafts and found to be a more ideal substrate for bone grafting in this study. Our findings are consistent with other studies examining the use of porous tantalum for foot and ankle reconstruction.

References