Tantalum in Total Hip Arthroplasty

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Long Term Success of THA

• Optimum Biomechanics

• Initial Stability (i.e. Shear strength).....

• Continued stability (till adequate osteointegration)

• Osteointegration (in uncemented prosthesis)

• Restoration of Bone Stock (in revision)
Tantalum

- "Trabecular Metal"
- Has "spongy" structure
- Bone like physical and mechanical properties
- Highly Biocompatible
- Highly porous
- High interface shear strength.


High strength-to-weight ratio. Can withstand physiological loading

- Compressive strength
- Elastic modulus

More similar to bone

- Low Stiffness
- High Friction Coefficient
Osteointegration is better than any other currently available surface

- Porosity of Beads (Porous Coating) and Fibre Metal (Titanium) = 30% to 50% by volume.

- Porosity of Tantalum = is 75% to 85% by volume.
Porosity – Bone Ingrowth
Bone Graft

- Restore Bone Stock
- Osteointegration
- Initial Stability
- Continued Stability till adequate osteointegration
- Impaired mechanical strength to support implant during creeping substitution - Remodeling and Resorption.
Tantalum

- Initial Stability
- Osteointegration
- Continued Stability till adequate osteointegration
- Excellent mechanical strength to support the implant during osteointegration.
Clinical Examples
What do clinical studies reveal
Acetabular Component Revision Using a Porous Tantalum Biomaterial

**Abstract:** Biologic ingrowth can be difficult to achieve in acetabular component revision, especially in cases with significant bone loss. The purpose of this study was to review our clinical results of acetabular component revisions in patients with significant bone loss using a porous tantalum biomaterial. This is a retrospective review of 25 patients. There were 16 females and 9 males with a mean age of 71.7 ± 10.54 years. The mean follow up was 39 ± 11.09 months (range, 28-55 months). All patients in this series had combined segmental and cavitary bone loss, Paprosky type 2 or type 3. Of 22 patients in this series, 21 had a well-fixed and functioning implant at latest follow up. All 21 patients developed ingrowth along the tantalum surface despite compromised host bone. There were no cases of dislocation or aseptic loosening. Porous tantalum appears to be a promising material for use in revision hip arthroplasty to facilitate biologic ingrowth in patients with acetabular bone loss. **Key words:** acetabular, component, revision, porous, tantalum. © 2008 Published by Elsevier Inc.
Addressing Severe Bone Deficiency

What a Cage Will Not Do

Wayne G. Paprosky, MD, Scott S. Sporer, MD, and Brian P. Murphy, MD

Abstract: Managing severe acetabular bone loss in total hip arthroplasty revision can be a tremendous challenge. Osteolysis and migration of the acetabular component can lead to large uncontained defects. Traditionally, these deficiencies have been treated with allograft with or without the support of a cage. In severe cases, a majority of the cage support is via allograft instead of host bone. Sometimes, with remodeling and resorption of the allograft, the cage can lose structural support, leading to fatigue and failure. In these situations, trabecular metal has become a viable alternative. Deficiencies of acetabular bone can be independently addressed and reconstructed providing initial stability and, we believe, long-term biologic fixation to host bone. Key words: revision hip arthroplasty, trabecular metal augments, cage, severe acetabular deficiency, acetabular reconstruction.

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Radiographic Evaluation of a Monoblock Acetabular Component

A Multicenter Study With 2- to 5-Year Results

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Abstract: Serial radiographs of a porous tantalum monoblock acetabular cup design were evaluated for cup stability and signs of successful osteointegration. Of 574 primary consecutive total hip replacements in 542 patients performed by 9 surgeons at 7 hospitals, 414 cases were available for minimum 2-year follow-up. Follow-up averaged 33 months and ranged from 24 to 58 months. Postoperative radiographs revealed acetabular gaps in 100 zones in 80 (19%) hips: 29 in zone I, 67 in zone II, and 4 in zone III. At last follow-up, 84 (84%) of the zones with gaps completely filled in, and all 4- and 5-mm gaps filled in. There was no progression of any postoperative gap, no evidence of continuous periacetabular interface radiolucencies, no evidence of lysis, and no revisions for loosening. Although these short-term results are encouraging, further follow-up will be required to assess whether the monoblock design and the low modulus of elasticity of porous tantalum will reduce the incidence of periacetabular stress shielding and occurrence of osteolysis. Key words: hip arthroplasty, acetabular component, implant fixation, clinical results, radiographic evaluation, gaps, interface, radiolucency.

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