May 20th, 12:30 PM

Radiostereometric Analysis of Tantalum vs. Titanium Acetabular Shells in Young THR Patients

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Et al.

Title: Radiostereometric Analysis of Tantalum vs. Titanium Acetabular Shells in Young THR Patients

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Introduction:
In the active total hip replacement (THR) population, maintaining acetabular component stability and limiting polyethylene wear are crucial components to preventing premature implant failure. Titanium with Co/Cr/Mo fiber metal coating is among the most common materials used in cementless THR. Trabecular metal, composed of porous tantalum, has a metallic strut design resembling trabecular bone, designed to improve tissue infiltration and limit migration. This study assesses the stability and clinical outcomes of tantalum versus titanium acetabular shells using radiostereometric analysis (RSA) technology.

Methods:
In this IRB approved, prospective, randomized, blinded study, 46 patients received a primary THR by a single surgeon (DCA). Each patient was randomized to receive a titanium (23) (Trilogy, Zimmer) or tantalum (23) (Modular tantalum shell, Zimmer) uncemented hemispheric cup and either a highly-crosslinked or conventional polyethylene liner. Tantalum RSA markers were implanted around the liner periphery, femur, and periacetabular bone in each patient. RSA examinations, Harris Hip, UCLA, WOMAC, SF-36 scores were obtained at 10 days, 6 months, and annually with the furthest patients evaluated through 5 years.

Results:
Median translation was greater at all time points for the tantalum mesh cups except for the 3-year follow-up, however due to large standard errors, there was no significant difference between the two designs *($p>0.05$)*. These large standard errors were predominantly caused by two outliers, neither of which had clinical evidence of loosening at 5 years follow-up. Mean UCLA, WOMAC, Harris Hip, and SF-36 PCS and MCS scores improved similarly in both groups.

Conclusions:
In this young THR population, both titanium and tantalum acetabular shells demonstrated excellent stability at five years follow up. Tantalum shells demonstrated slightly greater micromotion, but there was no statistically significant difference in shell migration. Outstanding clinical outcomes with statistically significant improvements in function and pain relief were observed in both groups.