TANTALUM VERSUS TITANIUM ACETABULAR SHELLS IN YOUNG ACTIVE THR PATIENTS: A RADIOSTEREOMETRIC ANALYSIS (RSA) STUDY

David Ayers[a] Marie Walcott, [a] Benjamin Snyder,[a] Michelle Aubin,[a] Jacob Drew,[a] Peyton Hays,[a] Michelle Aubin,[a] Mark Eskander,[a] David Ayers,[a] Henrik Malchau,[b] Charles Bragdon[b]

[a]Department of Orthopedics and Physical Rehabilitation, University of Massachusetts Medical School, Worcester, MA; [b]Massachusetts General Hospital, Boston, MA

Contact information: Benjamin Snyder, MD; Email: benjamin.snyder@umassmemorial.org

Abstract:

Introduction: In the active THR (total hip replacement) population, acetabular component stability is crucial for preventing implant failure. Titanium fiber metal coating is the most common material used in cementless THR. Trabecular metal, composed of porous tantalum, is designed to improve tissue infiltration and limit migration. It is unknown if tantalum offers an advantage over titanium in the biologic fixation of porous-coated acetabular shells. Radiostereometric analysis (RSA) provides highly precise measurements of micromotion that are otherwise not detectable by routine radiographs.

Methods: In this IRB approved, prospective, randomized, blinded study, 46 patients received a primary THR by a single surgeon. Each patient was randomized to receive a titanium (23) or tantalum (23) uncemented cup. Tantalum RSA markers were implanted around the polyethylene liner and into the patient's femur and periacetabular bone. Also, patients received either a highly cross-linked (n=25) or a conventional liner (n=21). RSA examinations, Harris Hip, UCLA, WOMAC, SF-12 scores were obtained at 10 days, 6 months, and annually through 5 years.

Results: The randomized groups had comparable mean age, preoperative activity, and average BMI. The tantalum shells demonstrated less median translation than the titanium shells at each time-point, but there was no statistical difference between the two shells. At 6 months median translation of tantalum and titanium was -0.01mm and 0.04mm and remained stable with median translation of -0.02mm and 0.04mm at four years. Mean UCLA, WOMAC, Harris Hip, and SF-12 PCS and MCS scores improved similarly in both groups.

Conclusions: After THR, both patient cohorts had excellent clinical outcomes with statistically significant improvements in function and pain relief. Although tantalum porous-coated acetabular shells demonstrated less y-translation and y-rotation at all time points, there was no statistically significant difference in shell migration and both shells demonstrated excellent stability with minimal micromotion at four years.