

3 Year Multicenter RSA Evaluation of Vitamin E Diffused Highly Cross-Linked Polyethylene Liners and Acetabular Cup Stability

Nanna H. Sillesen, MD, Meredith E. Greene, Audrey Nebergall, BA, Poul T. Nielsen, MD, Mogens B. Laursen, MD, PhD, Anders Troelsen, MD, PhD, DMSc, Henrik Malchau, MD, PhD

Introduction: Vitamin E diffusion into highly cross-linked polyethylene (VEPE) is a method for enhancing long-term oxidative stability of hip arthroplasty liners. Early clinical outcome is important to document that there are no detrimental effects of new developments. The purpose of this study was to evaluate in vivo wear properties of VEPE and the stability of a porous-titanium coated acetabular cup using radiostereometric analysis (RSA).

Methods: 144 patients were recruited into a prospective 5 years RSA study at 2 centers. All patients received porous-titanium coated cups and either VEPE or non-vitamin E medium cross-linked liners (XLPE). Cobalt-chrome or ceramic femoral heads were used, 32mm or 36mm. At Center1 the acetabulum was under reamed by 1 mm and at Center2 it was reamed size-to-size.

Results: There was no statistically significant difference ($p=0.203$) in femoral head penetration into the VEPE liners at 3 years comparing the 32mm metal heads ($-0.002\pm 0.02\text{mm}$) with the 32mm ceramic heads ($-0.04\pm 0.06\text{mm}$). There was no difference ($p=0.087$) in head penetration into VEPE liners at Center1 compared with XLPE liners at Center2 ($0.02\pm 0.05\text{mm}$); however there was statistically significant less wear in VEPE than XLPE liners at 3 years at Center2 ($p=0.017$).

One year median proximal cup migration at Center1 ($0.14\pm 0.03\text{mm}$) was significant lower than at Center2 ($0.38\pm 0.06\text{mm}$) ($p=0.001$). Median cup migration at Center1 remained stable at 3 years ($0.15\pm 0.05\text{mm}$); however Center 2 showed significant continual cup-migration at 3 years ($0.45\pm 0.09\text{mm}$) ($p\leq 0.002$).

Discussion: This study provides the first multicenter in vivo wear measurement of VEPE liners using RSA. The 3year VEPE results indicate low liner penetration regardless of head material or size with no significant difference between centers. Despite a statistically significant difference at Center2 between patients with VEPE and XLPE liners at 3 years the penetration measured is not clinically significant. The 3-year follow-up shows a low amount of early cup-movement.