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The Relationship Between Polyethylene Wear and Peri-prosthetic Osteolysis in THA - A 12-year RCT

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INTRODUCTION: Polyethylene acetabular components have been commonplace since the emergence of total hip arthroplasty (THA). Recent advances have shown newer generations of highly cross-linked polyethylene (HXLPE) to be superior in wear performance than the previous ultra high molecular weight polyethylene (UHMWPE). Evidence also shows that polyethylene wear particles result in the release of proinflammatory mediators and induce inflammation causing periprosthetic osteolysis, and hence, contribute to implant loosening. This is a prospective double blind RCT study to examine the extent of osteolysis in patients randomized to either HXLPE or UHMWPE.

METHODS: Fifty-four patients were recruited, all received THA using a cemented collarless tapered stem with 28mm cobalt chrome head and uncemented acetabular component. Patients were randomized to HXLPE or UHMWPE liner (n = 27 per group). Patients, surgeons and assessors were blinded to treatment allocation. This cohort has previously been analysed using Radiostereometric analysis (RSA) demonstrating significantly lower volumetric wear in the HXLPE group. Patients were recalled and underwent CT. Images were then analyzed for periprosthetic osteolysis. Areas of lucency around acetabular implants were classified according to Charnley Zones and measured in length and depth.

RESULTS: At a minimum of 12 years postoperatively, 18 patients (33.3%) had been lost to follow up (five had died, four were too unwell to return, three had moved away, one had a periprosthetic fracture, and five withdrew from the study early). Another six patients (11.1%) had radiographs which were inadequate for RSA analysis. In the UHMWPE group we observed osteolysis in Charnley Zone one in 50% of patients and in Zone two in 70% compared with 33% and 67% in the HXLPE group respectively. There was no evidence of osteolysis in Zone three in any patient from either group. None of the components analyzed were loose and there were no revision operations during the period of study. This cohort has previously undergone volumetric wear analysis using RSA and shown wear was significantly lower in the HXLPE group. No significant difference between the two groups was identified.

CONCLUSION: In this cohort, patients with HXLPE have not been shown to be at any greater risk of peri-prosthetic osteolysis than those with older generation UHMWPE showing that the improved wear properties of HXLPE does not alter the risk of implant failure.