

# **Influence of Manufacturing Characteristics of Highly Cross-Linked Polyethylenes on Femoral Head Penetration in Total Hip Replacement: A 10- to 20-Year Follow-Up Study**

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**INTRODUCTION:** Highly cross-linked polyethylene (HXLPE) has decreased wear and revision rates in total hip replacement (THR) at a long-term. However, the effect of HXLPE manufacturing characteristics on femoral head penetration has not been clearly defined yet. We report this single-institution study to investigate the clinical and radiological results of different HXLPE liners in THR.

## **METHODS:**

In this retrospective cohort analysis of our prospective database, we identified 1,062 THRs performed between 2000 and 2013. Seven different HXLPE liner types were assessed: remelted (3), annealed (2), sequentially annealed (1), and vitamin E-doped (1). The linear femoral head penetration rate was measured at six weeks, one year, and annually thereafter.

**RESULTS:** Fifty-six hips were revised for the following reasons: aseptic loosening (24), dislocation (21), periprosthetic femoral fracture (8), and infection (3). A total of 831 THRs were evaluated for a mean follow up of 15 years (range, 10 to 20). No hip was revised for wear or osteolysis. The mean Harris Hip Score was similar among HXLPE groups at different intervals. The mean wear in the remelted HXLPE group with a total radiation dose of 5 Mrad one (creep) (0.13 mm (SD 0.06)), and 15 years after surgery (0.41 mm (SD 0.3)), was greater than in the other groups ( $p=0.02$ , and  $p<0.001$ , respectively). The same HXLPE group showed a greater mean femoral head penetration at 10 years, 0.03 mm/year (SD 0.03), than in the other groups 0.02 mm/year (SD 0.01) ( $p=0.002$ ). Eleven hips showed a mean wear higher than 0.10 mm/year: 5 in the remelted group, 5 in the gamma-irradiated in gas with 10 Mrad annealed group, and one in the electron-beam irradiated (100 kGy) remelted group.

## **DISCUSSION AND CONCLUSION:**

Although HXLPE characteristics can result in a different wear performance in patients undergoing THR at a mean follow up of 15 years, the clinical results are excellent. Nevertheless, these patients should continue to be monitored to detect future problems.