Thin Highly Cross-linked Polyethylene Liners Combined With Large Femoral Heads In Primary Total Hip Arthroplasty Shows Excellent Survival And Low Wear Rates At A Mean Follow-up Of 12.8 Years

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INTRODUCTION:

With the introduction of highly crosslinked polyethylene (HXLPE) liners in total hip arthroplasty (THA), orthopaedic surgeons have moved towards using larger femoral heads at the cost of thinner liners to decrease the risk of instability. Several short and mid-term studies have shown minimal liner wear with HXLPE liners, but the safety of using thinner HXLPE liners to maximize femoral head size remains uncertain. The objective of this study was to analyze the long-term results of the use of large heads and thin HXLPE liners in primary THA, including revision rates, liner-specific revision rates, and radiological wear rates.

METHODS:

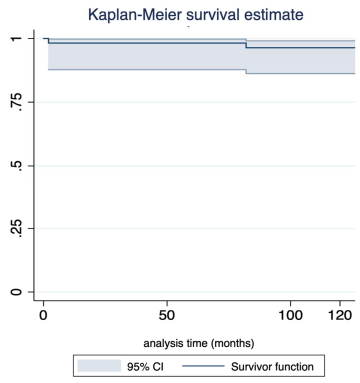
We performed a retrospective cohort study of all patients that underwent primary total hip arthroplasty in a high-volume single tertiary referral center between 2000 and 2010. We identified patients with minimum 10-year clinical follow-up that underwent primary THA using HXLPE liners with 36-mm heads in cups with an outer diameter of 52mm or smaller. Patient demographics, implant details, death, and all cause revisions were recorded. Cox regression and Kaplan-Meier survival curves were used to determine all-cause and liner specific revision. Patients that had a minimum radiographic follow-up of seven years were assessed radiographically for linear and volumetric wear using a validated open-source software by two independent researchers. The same reviewers repeated these measurements 6 weeks later. Intra and interobserver reliability was calculated using intraclass correlation coefficients (ICC).

RESULTS:

A total of 2585 primary total hip arthroplasty surgeries using HXLPE were identified, of which 55 patients had a 36 mm head with a 52- or 50mm cup. Mean age was 71.4 years (38.7 – 95.9), mean BMI was 29.0 (18.9 – 63.7) and 92.7% were female. Overall survival rate for all-cause revision was 94.5% (95% CI 81.7 – 97.2%) at 12.8 years (Figure 1). Three patients were revised: one for a periprosthetic fracture, one for trunnion corrosion with a pseudotumor and one for a late infection. There were no liner-related revisions. Twenty-two patients were included in the radiographic analysis, with a mean follow-up of 9.9 years (range 7.5 – 13.7). The mean linear wear rate per year was 0.011 mm/year (-0.006 - 0.028) and the mean volumetric wear rate was 11.097 mm3/year (95% CI -6.51 - 28.70) (Table 1). Using this method, there was a good interobserver (ICC: 0.81, 95% CI: 0.68 - 0.89) and good and excellent intraobserver ICC reliability (ICC: 0.77, 95% CI: 0.52 - 0.90 and ICC: 0.92, 95% CI: 0.82 - 0.97) (Figure 2).

DISCUSSION AND CONCLUSION:

Using HXLPE liners with 36-mm heads in 52-mm or smaller cups is a safe strategy, with excellent survival and low rates of linear and volumetric wear at long-term follow-up. Patients did not require revision surgery for liner complications such as fracture, dissociation, or wear. Our results suggest that the advantages of using larger heads outweigh the potential risks of using thin HXLPE liners.



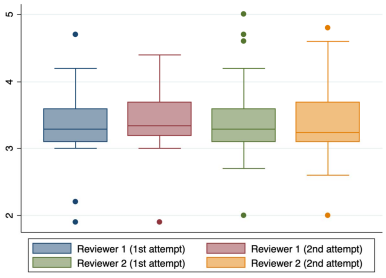


Table 1. Wear measurements

	All values	Corrected for negative wear
Linear wear (mm)	0.085 (-0.086 - 0.257)	0.205 (0.104 - 0.305)
Linear wear / year (mm)	0.011 (-0.006 - 0.028)	0.022 (0.011 - 0.033)
Volumetric wear (mm3/y)	11.01 (-6.51 - 28.70)	22.55 (11.55 - 33.56)

Data in mean with 95% confidence interval