

November 28, 2017

Reported ArComXL Wear Rate Not Representative of All XLPE Liners

Stuart Adam Callary

Senior Medical Scientist
Royal Adelaide Hospital

Other Contributors:

Lucian Bogdan Solomon

Professor
Royal Adelaide Hospital

Donald William Howie

Professor and Clinical Director
Royal Adelaide Hospital

In response to the article by Shareghi et al., we would like to highlight that the wear rate reported for the highly cross-linked polyethylene (XLPE) control liner (ArComXL) in this randomized controlled trial is not representative of the wear rate reported for other XLPE liners at the same follow-up.

Shareghi et al. report that the median proximal wear rate between two and five years of a vitamin E-infused XLPE liner (E1) was significantly lower than that of the control XLPE (ArComXL) liner. The difference in these wear rates and the divergence shown in the graph of proximal femoral head penetration in Figure 2 may be inadvertently misleading to the general orthopaedic community, who could assume vitamin E-infused XLPE liners are wearing less than all previous generations of XLPE liners.

While Shareghi et al. have correctly summarised in their conclusion that their reported wear rate of the vitamin E-infused liners is “about the same magnitude as observed for some previous versions of XLPE,” we remain concerned that this message will not be obvious to the general readership. The mean proximal wear rate of the ArComXL liner (0.04 mm/yr) is higher than the mean proximal wear rate reported in other radiostereometric-analysis (RSA) studies of XLPE liners at the same medium-term follow-up (0.02[1], 0.01[2], 0.01[3], 0.00[4], 0.00[5], and 0.01[6]). Hence, the mean proximal wear rate of E1 liners in this randomized trial (0.01 mm/yr) is not lower than that of many other XLPE liners.

A very similar randomized trial using RSA measurements by Nebergall et al. (7) also reported a significantly reduced median proximal wear rate at five years post primary THA for patients with an E1 liner compared to ArComXL. That study correctly describes the ArComXL as a “medium cross-linked polyethylene” because of the relatively low irradiation dose (50kGy) used to cross-link the polymer, and this may explain why its wear rate is not representative of all XLPE liners.

In summary, we believe it is important to make readers aware that the wear rates in this randomized trial do not suggest vitamin E-infused XLPE liners are wearing less than all previous XLPE liners.

References

1. Digas G, Karrholm J, Thanner J, Herberts P. 5-year experience of highly cross-linked polyethylene in cemented and uncemented sockets: two randomized studies using radiostereometric analysis. *Acta Orthop*. 2007;78:746-54.
2. Thomas GE, Simpson DJ, Mehmood S, Taylor A, McLardy-Smith P, Singh Gill H, Murray DW, Glyn-Jones S. The seven-year wear of highly cross-linked polyethylene in total hip arthroplasty: a double-blind, randomized controlled trial using radiostereometric analysis. *J Bone Joint Surg Am*. 2011;93:716-22.
3. Callary SA, Campbell DG, Mercer G, Nilsson KG, Field JR. Wear of a 5 megarad cross-linked polyethylene liner: a 6-year RSA study. *Clin Orthop Relat Res*. 2013;2238-44.
4. Callary SA, Field JR, Campbell DG. Low wear of a second-generation highly crosslinked polyethylene liner: A 5-year radiostereometric analysis study. *Clin Orthop Relat Res*. 2013;3596-600.
5. Callary SA, Field JR, Campbell DG. The rate of wear of second-generation highly crosslinked polyethylene liners five years post-operatively does not increase if large femoral heads are used. *Bone Joint J*. 2016;98-B:1604-10.
6. Nebergall AK, Troelsen A, Rubash HE, Malchau H, Rolfson O, Greene ME. Five-year experience of Vitamin E-diffused highly cross-linked polyethylene wear in total hip arthroplasty assessed by radiostereometric analysis. *J Arthroplasty*. 2016;31:1251-5.
7. Nebergall AK, Greene ME, Laursen MB, Nielsen PT, Malchau H, Troelsen A. Vitamin E diffused highly cross-linked polyethylene in total hip arthroplasty at five years: a randomised controlled trial using radiostereometric analysis. *Bone Joint J*. 2017;99-B:577-84.

Conflict of Interest: None Declared

Article Author Response

8 January 2018

Article Author(s) to Letter Writer(s)

We thank Dr. Callary and colleagues for their valuable comments on our article. We agree that it should be emphasized that ArComXL, the control polyethylene in our study, has a higher wear rate than most

evaluated highly cross-linked polyethylenes (XLPEs), perhaps attributed to the comparably low irradiation dose (50 kGy). Marathon® (DePuy, Warsaw, IN, USA) is another polyethylene irradiated with 50 kGy. In studies using RSA (1) and Hip Suite Analysis (2), Marathon has displayed a linear steady state wear similar to our result for ArComXL, while another RSA study has reported a considerably lower proximal wear rate (0.014 mm/yr) for the same polyethylene (3).

In the absence of a clearly agreed-upon definition of “XLPE,” one can discuss the classification of polyethylene quality perhaps to motivate labelling of XLPE, but we think that both ArComXL and Marathon belong to the XLPE group since they were developed as such. We do, however, agree that a more distinct definition of XLPE could facilitate clear and understandable reporting on the growing group of cross-linked polyethylenes, but orthopaedic surgeons will still have to be aware of their considerable heterogeneity with regard to manufacturing.

Finally, we appreciate the comment regarding our most important message: that the wear rate of the E1 liners studied by us is about equal to that of many other types of XLPE. Thus, so far, this material has no proven advantages or disadvantages in the clinical setting, and still lacks clinical documentation in the longer term.

References

1. Flato B, Ryding J, Dahl J, Rohrl SM, Nordsletten L. Low wear, high stability - promises of success in a moderately cross-linked cup? Hip international : the journal of clinical and experimental research on hip pathology and therapy. 2015;25(3):199-203.
2. Engh CA, Jr., Hopper RH, Jr., Huynh C, Ho H, Sritulanondha S, Engh CA, Sr. A prospective, randomized study of cross-linked and non-cross-linked polyethylene for total hip arthroplasty at 10-year follow-up. The Journal of arthroplasty. 2012;27(8 Suppl):2-7 e1.
3. Callary SA, Campbell DG, Mercer G, Nilsson KG, Field JR. Wear of a 5 megarad cross-linked polyethylene liner: a 6-year RSA study. Clinical orthopaedics and related research. 2013;471(7):2238-44.