

TABLE E-1 Summary of Studies Comparing Blood Metal Ion Levels in Patients with Hip Resurfacing and Large-Diameter Metal-on-Metal Total Hip Implants*

Study	Journal	Hip Implant (No. and Type)	Functional Results	Sample Type	Cobalt	Chromium	Summary of Metal Ion Results
Witzleb et al. ⁷ (2006)	Acta Orthop	111 HR (BHR); 60 THA (28-mm Metasul)	Well-functioning	Serum	HR, 4.28; THA, 1.7	HR, 5.12; THA, 1.22	HR had much greater (and significantly higher) levels than THA did
Garbuz et al. ¹¹ (2010)	Clin Orthop Relat Res	48 HR (Durom); 56 LD THA (Durom)	Well-functioning	Serum	HR, 0.54; LD THA, 5.38	HR, 0.84; LD THA, 2.88	Cobalt and chromium ion levels greater in LD THA than in HR from same manufacturer
Vendittoli et al. ⁸ (2010)	Hip Int	64 HR (Durom); 53 THA (28-mm Metasul)	Well-functioning	Whole blood	HR, 0.67; THA, 0.94	HR, 1.58; THA, 1.62	No differences at 24 months in chromium and cobalt ion levels between HR and THA groups
Langton et al. ¹² (2010)	J Bone Joint Surg Br	228 HR (138 ASR and 90 BHR); 19 LD THA (ASR XL)	Most well-functioning; some failed	Whole blood	HR (BHR), 1.8; HR (ASR), 2.74; LD THA (ASR XL), 3.26	HR (BHR), 4.16; HR (ASR), 4.19; LD THA (ASR XL), 3.71	Patients with metal-sensitivity reactions had significantly higher levels of cobalt and chromium ions; only one ASR THA in the failed group
Langton et al. ²⁶ (2011)	J Bone Joint Surg Br	206 HR (ASR); 51 LD THA (ASR XL)	Most well-functioning; 25% of HR and 49% of LD THA failed	Whole blood	HR, 2.1; LD THA, 3.2	Not reported	26% of 257 hips had serum cobalt ion levels >7 µg/L
Lavigne et al. ¹³ (2011)	J Bone Joint Surg Am	144 LD THA (Durom, Magnum, ASR, and BHR)	Nearly all well-functioning; one failed	Whole blood	Durom, 2.68; Magnum, 0.65; ASR, 1.29; BHR, 1.86	Durom, 1.3; Magnum, 1.11; ASR, 1.34; BHR, 1.9	Cobalt and chromium ion levels highest with Durom (cobalt-chromium taper sleeve) and lowest with Magnum (titanium taper sleeve)
Matthies et al. ¹⁴ (2011)	J Bone Joint Surg Br	60 HR (Adept, ASR, BHR, Cormet, and Durom); 60 LD THA (Adept, ASR, BHR, Cormet, Durom, Mitch, and Magnum)	All failed	Whole blood	HR, 11.1; LD THA, 9.64	HR, 6.52; LD THA, 4.22	No significant difference in metal ion levels between failed HR and failed LD total hip implants

*Median values are given, in micrograms per liter (parts per billion), for the metal ions levels. Values for unilateral replacements are from the most recent follow-up. HR = hip resurfacing, BHR = Birmingham Hip Resurfacing, THA = total hip arthroplasty (implants with modular-neck stems), ASR = Articular Surface Replacement, and LD = large diameter (>36 mm).

*AUC = area under the (receiver operating characteristic) curve, and Max (Co, Cr) = the maximum value of either whole blood cobalt or chromium ions.