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Underestimated Significance of Mechanically Assisted Crevice Corrosion

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We read with interest the article by Persson, et. al.

We commend the authors for publishing a prevalence study of revision for symptomatic adverse local tissue reaction (ALTR) associated with mechanically assisted crevice corrosion (MACC), as joint registries almost certainly underestimate this diagnosis. Not only is this specific diagnosis not available for coding/record-keeping in most registries, but also (as Persson et al. found) it is often a concomitant diagnosis (1) and may not be recognized as the primary diagnosis by the operating surgeon.

The relationship between MACC, serum metal levels, cross-sectional imaging abnormalities, ALTR, and hip arthroplasty failure is complex and currently being scrutinized in the research community; but the Persson et al. study may underestimate the overarching problem by focusing solely on the prevalence of surgically confirmed ALTRs.

A single surgeon cohort of 1,352 hip replacements reported the prevalence of symptomatic MACC (2) to be 3.2%, with a single company's (Zimmer, Inc.) titanium alloy 12/14 taper over a 10-year period. There were 43/1,352 hips with symptomatic MACC, but in 16 of those 43 hips the symptoms were transient, the cross-sectional imaging was negative for ALTR (3), and the patients opted for careful follow-up rather than surgery. Eight of the 43 had significant symptoms with normal or minimal findings on metal artifact reduction sequence magnetic resonance imaging, and those 8 underwent revision surgery. Therefore, if we compare the present study with our findings and use a conversion factor of 44.2% (19 patients treated surgically out of 43 patients with symptomatic MACC and ALTR), a prevalence of 0.5% for revision surgery corresponds with an estimated 1.1% prevalence for symptomatic MACC.

Although this number is similar to that reported in our original publication (4), we have subsequently reported a disturbingly high rate of symptomatic MACC based on the year of implantation. The prevalence of symptomatic MACC noted for the Zimmer 12/14 taper in our cohort was significantly higher between 2009 and 2012 and also for the M/L taper style of stem (2).

Persson and colleagues further hypothesize that serum cobalt (Co) measurements may not be important in the diagnosis and treatment of ALTRs associated with metal-on-polyethylene (MoP) total hip arthroplasty (THA). We disagree. The authors state that “our pseudotumor cohort showed relatively low levels of blood metal ions, with only 3 patients presenting with Co levels above the proposed safe level of 5 µg/L and none showing Cr levels above the proposed safe level of 1.7 µg/L.” We are not familiar with the information the authors are referring to (perhaps these numbers are threshold values proposed for metal-on-metal articulations), but prior manuscripts have shown that a large portion of successful THA patients with MoP hips have serum Co <1 ppb (µg/L), even at extended follow-up (2, 5); that a serum cutoff of 1 ppb is associated with ALTR (6, 7); and that even with low levels of serum Co (<10 ppb), there are toxic intra-articular levels (8, 9). Even though the level of Co may not correlate with the pathological grade of the ALTR, there is strong evidence that a serum Co level >1 ppb on two independent samples is diagnostic of MACC-associated ALTR.

Whether MACC itself ultimately warrants revision requires further investigation; but the dramatically poor results of revision when corrosion is associated with persistent symptoms (10-12) make it incumbent on surgeons not to underestimate the prevalence or significance of MACC.

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Conflict of Interest: None Declared