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QUESTION 5: Does the use of a modular femoral neck implants during primary total hip arthroplasty (THA) affect the risks of subsequent surgical site infections/periprosthetic joint infections (SSIs/PJIs)?

RECOMMENDATION: Modular femoral neck implants are associated with increased revision rates due to hardware failure, metal corrosion and adverse local tissue reaction (ALTR). In patients with failed THA as a result of use of a modular femoral neck, a higher incidence of subsequent SSIs/PJIs is expected.

LEVEL OF EVIDENCE: Limited

DELEGATE VOTE: Agree: 72%, Disagree: 21%, Abstain: 7% (Super Majority, Strong Consensus)

RATIONALE

Modular femoral neck systems were introduced as an alternative to fixed neck systems to allow surgeons better ability to restore the biomechanics of the hip including neck angle, offset, anteversion and leg length [1,2]. However, modular femoral neck THA implants are associated with high early revision rates and poor long-term survivorships [3–8]. Reported modes of failure include hardware fracture [9–12], aseptic loosening [13] and metal corrosion resulting in ALTR [14–21]. In fact, some designs have been recalled because of high revision rates as a result of metal debris from the modular junction [3,6,22]. The additional metal junction is vulnerable to mechanical failure, component disassociation, mechanically assisted crevice corrosion (MACC) as well as metal ion release [4,5,14,17,19,20]. All modular junctions have the potential to release metal ions as a result of corrosion, wear and micromovement [2,15,18,21,23,24].

Previous literature has suggested that metal-on-metal (MoM) bearing surfaces in THA predisposed patients to higher infection rates when compared with other bearing surfaces [25–31]. It has been posited that MoM wear and corrosion particles could change the periprosthetic environment and increase the risk of infection [29]. Potential reasons for this increased risk include changes in the immune system by wear particles such as reduced cell proliferation [29,30,32]. Since modular femoral neck systems release metal wear particles and produce ALTR similar to MoM implants, are they also at risk of increased rate of PJI?

A comprehensive analysis of the incidence of SSI or PJI after the use of modular femoral necks in primary THA has not been published. Thus, the available evidence on this topic is low-level.

Duwelius et al. compared 284 patients with non-modular stems to 594 patients with modular neck stems performed by one surgeon and with similar demographics [1]. There were no statistically significant differences in either deep or superficial infection at a mean follow-up of 2.4 years (0.7% PJI in modular group vs. 1.4% in non-modular group). Furthermore, in a review of the Australian Orthopaedic Association National Joint Replacement Registry data, there was no difference in the rate of revision for infection for modular neck prostheses (0.7% of 9,289 modular neck primary THAs) compared with non-modular prostheses (0.6% of 253,165 non modular primary THAs) [8].

With the limited literature available, the presence of a modular femoral neck does not appear to increase the risk of SSI/PJI in primary THA. However, it is important to note that the clinical presentation of ALTR caused by a modular neck prostheses, head-neck junction, or MoM articulation, may mimic that of infection, and is in fact associated with a higher incidence of PJI [27,33,34] and can cause a false positive alpha-defensin test [35,36]. For this reason, gross purulence was removed from the PJI diagnostic criteria given its low specificity for PJI [37]. Thus, the reason for revision may have been misdiagnosed in some cases. In addition, many of the articles reporting higher incidence of PJI in the MoM population were before the wide acceptance of the MusculoSkeletal Infection Society/International Consensus Meeting (MSIS/ICM) definition of PJI or are Medicare database studies. PJI must be included in the differential diagnosis of all symptomatic modular femoral neck THA using recently established criteria [38].

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QUESTION 6: Can implant factors (i.e., type of bearing) influence the thresholds for serum and synovial markers in acute and chronic periprosthetic joint infections (PJIs)?

RECOMMENDATION: Yes. Different bearing surfaces such as metal-on-metal (MoM), metal-on-polyethylene and dual taper modular stems in the setting of taper corrosion can influence the serum and synovial markers. Metal debris may interfere with automated cell counts. Manual cell counts are preferred when evaluating patients for PJIs who have elevated synovial fluid metal levels. Optimal thresholds for serum and synovial markers for diagnosing PJIs in these settings still need to be established.

LEVEL OF EVIDENCE: Moderate

DELEGATE VOTE: Agree: 97%, Disagree: 1%, Abstain: 2% (Unanimous, Strongest Consensus)