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CORR Insights®: High Risk of Failure With Bimodular Femoral Components in THA

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Where Are We Now?

Bimodular femoral components were introduced to incrementally improve THA

This CORR Insights® is a commentary on the article “High Risk of Failure With Bimodular Femoral Components in THA” by Pour and colleagues available at: DOI: [10.1007/s11999-015-4542-0](https://doi.org/10.1007/s11999-015-4542-0).

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outcomes by allowing more-refined intraoperative adjustment of femoral version and offset. Modularity provides great benefit to orthopaedic surgeons in many settings, but in some situations, it results in unintended consequences. Numerous studies have described early failure in THAs performed with bimodular femoral components. The current study by Pour and colleagues adds to the concerns regarding this design element. The authors found important relationships between large femoral head size, higher BMI, greater offset, and failure—all factors that would be expected to increase stress at the neck-body taper junction and potentiate neck fracture and/or corrosion of the modular taper junction. Some bimodular femoral component implants appear to have been particularly problematic and have been recalled [3]. Others, including the components described in the present paper, continue to be available. I believe the potential advantages of this design element are not worth the risk of introducing a new taper junction at the base of the femoral neck, and it is my impression that this belief is widely shared by arthroplasty surgeons.

Where Do We Need To Go?

There are several questions raised by this article that would indicate the need for future work. The first is an engineering question. Why are some taper junctions more problematic than others? In their study, Pour and colleague evaluated two similar bimodular stem designs. One appeared to have more problems with corrosion and fracture, while the other had more problems with femoral component loosening—a problem that may have had nothing to do with the bimodular design. Similarly, some bimodular stem designs have had more problems with taper corrosion and fracture than others. Understanding why may shed light on how tapers can be used safely in this and other locations.

The second question is a more-practical clinical concern: How do we manage patients who have had bimodular THA? In 2012, the American Academy of Orthopedic Surgeons published an information statement with recommendations for treating patients with metal-on-metal (MoM) hip arthroplasty, but there are, as yet, no guidelines specifically on the monitoring and management of patients

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with bimodular stems. Because bimodular THAs can fail in similar ways to MoM THAs, it seems to me that we need research to support surveillance and treatment guidelines both for symptomatic and asymptomatic patients who have bimodular implants.

The third question is broader and more difficult: How do we safely improve upon modern total hip arthroplasty, an already immensely successful operation? The current study highlights one of the many failed attempts to improve upon THA, and these attempts have involved real patients who unfortunately developed real problems as a result. Answering this question may allow us to innovate without experiencing such dramatic and costly failures.

How Do We Get There?

The engineering aspects of modular taper junctions have become a matter of great interest and intensive research during the last several years. Factors such as taper length, angle, surface finish, and rigidity are being evaluated. Beyond the engineering design considerations, however, surgical technique needs to be examined. Research and education should be conducted to instruct surgeons on the

best and most reproducible way to prepare and seat the tapers. It is likely that a combination of engineering design and surgical technique has contributed to the problems with modular taper junctions. From what we know now, I believe surgeons should take particular care to clean and dry the mating surfaces of the taper prior to impacting [2], and then impact the assembled junction in a direction that is in line with the taper junction. Impaction should be done with as large a force as is safe when considering the risk for femoral fracture [1].

Regarding the second question, specialty societies should consider developing a set of recommendations to help manage and monitor patients with bimodular femoral components. Since many of the problems of bimodular stems indeed overlap with the problems associated with MoM articulations, consideration should be given to amending those recommendations and potentially adding bimodular stems to the implants that are considered to be at risk and in need of monitoring. Research using large databases or registries may help to inform such recommendations.

The final question is the most difficult to answer. Innovation is the key to progress, but a needs assessment is critical. Attention should be directed to solving the most critical and costly

problems. In this way, the risk/benefit ratio becomes more favorable. In the wake of MoM THAs, FDA regulatory pathways are being reconsidered, and physician/innovator involvement in this process will be critical. Additionally, because problems in THA may take years to develop, surveillance with registries can help us detect problems earlier; many worldwide registries have demonstrated this, and perhaps the nascent US registry will likewise contribute.

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