



Does Taper Design Have an Effect on Taper Damage in Retrieved Total Hip Devices?

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Introduction: Taper design has been identified as a possible contributor to fretting corrosion damage at modular connections in THA systems but variations in as-manufactured taper interfaces may confound this analysis. This study characterizes taper damage in retrievals of two different taper sizes but comparable taper surface finishes and investigates if taper design is related to fretting and corrosion damage in the context of a multivariate analysis.

Methods: 252 CoCr femoral heads were identified in a collection of retrievals – 77 with Taper A and 175 with Taper B. Implantation time averaged 5.4 ± 6.0 years (range, 0 – 26 years) and the predominant revision reason was loosening ($n=93$). Explants were cleaned and analyzed using a 4-point semi-quantitative method. Step-forward multivariate linear modeling was used to identify factors affecting taper corrosion. Components were then selected to create two balanced cohorts, matched on the significant variables from the multivariate analysis.

Results: Implantation time ($p<0.001$), stem material ($p<0.001$), weight ($p<0.001$) and head offset ($p=0.001$) were identified as significant predictors of taper fretting and corrosion damage ($R^2 = 0.48$). Based on these factors, twenty- three (23) components with Taper A were matched to the same number of components with Taper B to account for covariates between the two taper cohorts. No difference was found in damage score between the matched cohorts (median = 2 for both cohorts, $p=0.34$).

Conclusion: These results support the hypothesis that fretting and corrosion damage is insensitive to differences between the two taper designs, when controlling for significant covariates. Though this study is limited by the semi- quantitative nature of damage scoring and limited matched cohort size, the multivariate model derived explains almost half of the fretting corrosion damage we observed and is consistent with other studies identifying implantation time, material combination and head offset as contributing factors.