

Mechanically Assisted Taper Corrosion in Modular TKA

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Introduction: Little is known about mechanically assisted crevice corrosion of modular tapers in TKA. Recently a case of adverse local tissue reaction (ALTR) has been reported at a TKA taper (McMaster 2013). The purpose of this study was to characterize the prevalence of taper damage in modular components for TKA.

Methods and Materials: 1873 retrieved TKA components were collected from 2002-2013 as part of a multi-center, IRB-approved retrieval program. 218 modular components from 159 revised knees were implanted for 3.7 ± 4.0 y (range: 0.0-17.5y). TKAs were predominantly revised for loosening, infection, and instability. Medical records were reviewed for sightings of ALTRs. Modular components were disassembled and evaluated for fretting corrosion using a semi-quantitative 4-point scoring system (1 being little-to-no fretting corrosion and 4 being extensive fretting corrosion) (Higgs 2013). Flexural rigidity, stem diameter, alloy coupling, patient weight, age and implantation time were assessed as predictors of fretting corrosion damage.

Results: Mild to severe fretting corrosion (score ≥ 2) of at least one component was observed in 106/111 (95.5%) of the tapers on the modular femoral components and 98/107 (91.6%) of the modular tibial components. Damage was more prevalent in mixed alloy pairs (Ti Alloy and CoCr) as compared to same alloy pairs. Clinical factors (e.g., Age, Weight, Implantation time) didn't correlate with fretting damage ($p > 0.05$). Threaded tapers had a lower damage score compared with conical tapers ($p < 0.0001$). Femoral components exhibited significantly greater fretting and corrosion damage as compared with tibial components ($p < 0.02$).

Discussion: The clinical implications of fretting and corrosion for TKA remain unclear, because modularity in TKA is typically reserved for unstable or revised knees, and we based our analysis of metallosis and ALTR on a retrospective review of clinical records. The majority of TKAs were cemented, which may also limit the diffusion of corrosion products.

