Paper #36

Taper Geometry and Head Size Both Affect Taper Fretting Corrosion in Total Hip Arthroplasty

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Introduction: Decreased fretting and corrosion at the taper interface of ceramic-on-polyethylene (CoP) vs. metal-on-polyethylene (MoP) total hip arthroplasties (THA) has been reported. Analyses have also indicated that smaller taper geometries and large femoral head sizes are associated with decreased or increased fretting and corrosion damage, respectively.

Methods: Eight cohorts were established from 157 retrieved CoP or MoP THA implants based on femoral head composition (n=95, zirconia-toughened alumina [ZTA]; n=62, cobalt chromium alloy [CoCr]); femoral head size (n=56, 32mm or n=101, 36mm); and taper geometry (n=84, 12/14 or n=73, V40). THA implants were evaluated and graded for fretting, corrosion, and damage at the taper interface. Data were statistically analyzed with significance defined as $p<0.05$. Mean age at index THA was 63 years, 61% were female, and mean body mass index was 29.3 kg/m2. The mean duration of implantation was 17 months (range: 0-138 months).

Results: Lower rates of moderate-to-severe fretting and corrosion damage were exhibited on ZTA heads (ZTA=13%, CoCr=38%); smaller heads (32mm=18%, 36mm=26%); and 12/14 tapers (12/14=13%, V40=35%). ZTA+32mm heads demonstrated the lowest rates of moderate-to-severe fretting and corrosion damage [2% (12/14 taper), 7% (V40 taper)]; while, CoCr heads with V40 tapers demonstrated the highest rates of moderate-to-severe fretting and corrosion at 47% (32mm head) and 59% (36mm head).

Conclusions: In this series, implants with 32mm heads, 12/14 tapers, and ZTA heads exhibited lower rates of moderate-to-severe damage scores. Isolating implant features may provide additional information regarding the factors leading to fretting and corrosion damage in THA.

Notes