Unexpected High Rates of Corrosion related Revisions: Short-term Results of the Modular Neck Rejuvenate Stem

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Introduction: The Rejuvenate modular neck stem (Stryker, Mahwah, NJ) was recently recalled due to corrosion at the neck-stem junction [1,2]. The purpose of this study was to investigate the rate of corrosion related failure and survivorship of this implant; and analyze the correlation between the implant and patient factors with serum metal ion levels.

Methods: Between June 2009 and July 2012, 123 Rejuvenate stems (97 modular and 26 non-modular) THAs were implanted in 104 patients by a single surgeon. Serum cobalt (Co) and chromium (Cr) levels (microgram per liter [µg/L]) were obtained post-operatively in all patients. Patients with persistent hip pain or elevated metal ion levels underwent magnetic resonance imaging for assessment of osteolysis or adverse local tissue reactions. Correlation between implant factors (implant size, head size, head length, offset), patient factors (age, gender, BMI) with serum metal ion levels and revisions were analyzed using logistic regression models.

Results: The mean follow-up was 2.7 ± 0.6 years. The mean Co and Cr levels were 5.4 ± 5.7 µg/L (0.2 - 31) and 2.1 ± 1.5 µg/L (0.1 - 4.3), respectively. The differences between the Co and Cr levels in the two groups (modular vs. non-modular) were statistically significant: 49% of THAs in the modular group had elevated metal ion levels (Co > 4.0 µg/L and Cr > 2.0 µg/L, p<0.05). The metal ion levels in the non-modular group were within normal limits. There was a significant correlation between elevated metal ion levels and younger age (p=0.04). There was a 5% increase in odds of high cobalt per 1-year decrease in age. We also found a significant correlation between increase in neck length/offset and high cobalt levels (p=0.04). There was a 30% increase in odds of high cobalt levels per one millimeter increase in offset. Presence of pain and high cobalt levels were significant predictors for revision surgery. The rate of revision at the time of this study for the modular group was 28% and the majority was in the 2nd year after surgery. In all revision cases, there was visible black corrosion at the neck-stem junction intra-operatively (figure - 1). The Kaplan-Meier survivorship was 40% at 4 years.

Discussion: Several mechanical factors affect the extent of fretting damage such as contact pressure and micromotion [3,4], which is influenced by material coupling, assembly and load conditions [5]. The combination of metallurgy mismatch between the modular neck and stem and longer neck length (offset) in younger patients can be a possible explanation. We anticipate more revisions in the near future.

Significance: The short-term high rate of corrosion related revision with Rejuvenate modular neck stems is remarkable. The future failures in the modular stems that are not revised at this time may continue and more patients will become symptomatic. We recommend that any patient with the modular Rejuvenate stem with pain and elevated Co/Cr levels should be thoroughly investigated.

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References: