# Fretting Wear and Fatigue Analysis of a Modular Implant for Total Hip Replacement

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## Abstract

Modular orthopaedic devices are a feature of total joint replacements today. These modular orthopaedic devices allowing surgeons to choose from a variety of available implant sizes, designs & material options for the procedure required and the patient specific requirements. However, even though this allows for greater scope of implant construction, if the various components of the modular design are not ideally matched, this can lead to fretting fatigue & corrosion, due to the resulting micro-motion & contact stresses found at the mismatched surfaces during cyclical loading. This results in interface wear, which can lead to implant rejection due to wear debris induced osteolysis. In this study we assess implant design changes between a modular femoral stem and femur head implant and quantify the resulting fretting fatigue & wear over a gait cycle.

## Figures used in the abstract

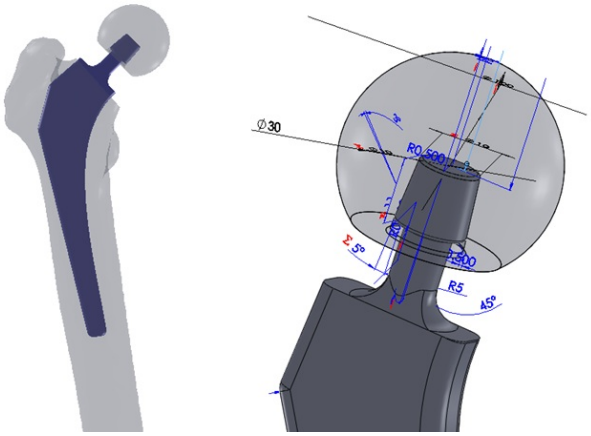


**Figure 1**: Image of implanted modular stem & femur head in femur (left) and illustration of various modular dimensions on both stem & femur head (right).

**Figure 2**: Illustration of three variations in modular fit angles between stem neck & femur head resulting in different modular outcomes.

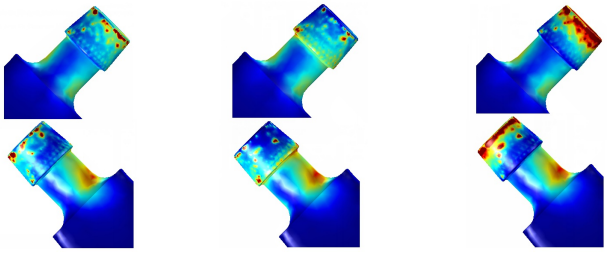

**Figure 3**: Images of cycles to fatigue (material) failure for the three variations in modular fit angles between stem neck & femur head.

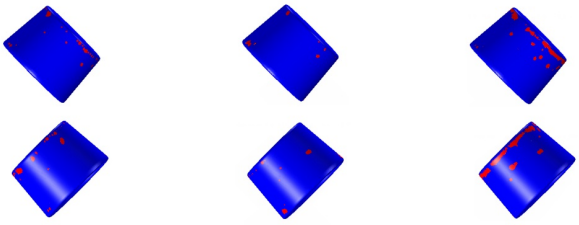

**Figure 4**: Images of fretting fatigue on stem neck for the three variations in modular fit angles between stem neck & femur head.