

Femoral Component Design Influences Risk of Periprosthetic Femur Fracture After Total Hip Arthroplasty: An Analysis From the American Joint Replacement Registry

Mackenzie Kelly, Antonia F Chen, Sean Patrick Ryan, Zachary Mark Working, Ayushmita De, Kyle Mullen, Kimberly Porter, Ryland Phillip Kagan¹

¹Oregon Health & Science University

INTRODUCTION:

Post-operative periprosthetic femur fracture (PPFx) is a severe complication after total hip arthroplasty (THA). The influence of femoral component design and risk for PPFx has yet to be clearly identified. We examine the risk of PPFx after cement-less THA comparing commonly used femoral implant designs.

METHODS:

An analysis of primary THA cases in patients age 65 years or older was performed with American Joint Replacement Registry data linked to Centers for Medicare and Medicaid Services data from 2012-2020 to supplement outcome events. Patient demographics, and revision or open reduction and internal fixation for PPFx were recorded. Analysis compared the most commonly used femoral stem designs stratified using the Chen Classification including type 2 single-wedge, type 3 double-wedge, and type 4 gradual taper metaphyseal filling designs. Cox proportional hazard regression analysis was used to evaluate the association of femoral stem design and PPFx risk adjusting for age, gender and the competing risk of mortality.

RESULTS:

We identified a total of 279,052 primary THAs for analysis. There were 112,231 (40.2%) type 2 designs, 57,758 (20.7%) type 3, and 62,983 (22.6%) type 4 designs. There was no difference in the risk of PPFx for type 3 compared to type 2 designs (HR 1.007 [95% CI 0.826, 1.228], $p = 0.945$). Compared to type 2, type 4 designs showed decreased risk of PPFx (HR 0.341 [95% CI 0.254, 0.457] $p < 0.0001$).

DISCUSSION AND CONCLUSION:

Type 4 gradual taper/metadiaphyseal-filling stem designs showed a decreased risk for PPFx after THA with no difference in fracture risk noted between type 2 and type 3 stems. This information should be considered when selecting femoral component design for patients ≥ 65 years old to reduce the risk of PPFx.