

## **Does Femoral Morphology Predict the Risk of Periprosthetic Fracture After Cementless Total Hip Arthroplasty?**

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**Introduction:** Periprosthetic femur fracture remains a leading mode of early failure following cementless total hip arthroplasty (THA). The purpose of this study was to determine if a specific femoral morphology is associated with an increased risk of periprosthetic fracture after cementless THA.

**Methods:** An institutional arthroplasty registry was used to identify 35 primary, cementless THAs revised for acute, postoperative periprosthetic fracture (“fracture” cohort). Patients were matched 1:2 to 70 THAs without fracture (“control” cohort) for age, BMI, gender, and stem design. Preoperative radiographic measurements performed on AP pelvis and femur radiographs included the neck-shaft angle, endosteal width at four locations and external cortical diameter at two locations. Measurements were used to calculate the morphological cortical index (MCI), canal flare index (CFI), canal calcar ratio (CCR), and canal bone ratio (CBR). Postoperative measurements included canal fill, stem alignment, and distal stem cortical contact. Statistical analyses included clustered regressions, Fisher’s Exact, and Student’s T test.

**Results:** Greater endosteal width in fracture vs. control patients at 10cm distal to the lesser trochanter (15.28 vs. 14.37,  $p=0.1$ ) resulted in differences in the CFI (3.05 vs 3.28,  $p=0.03$ ), CCR (0.50 vs. 0.47,  $p=0.03$ ), and CBR (0.46 vs. 0.43,  $p=0.03$ ) between the two groups. These measurements indicate decreased meta-diaphyseal taper in fracture patients. Femoral neck angle was more varus in fracture patients (131.4 vs. 134.6 degrees,  $p=0.04$ ). There were no differences in the stem canal fill (0.84 vs. 0.86 at mid-third,  $p=0.1$ ; 0.85 vs. 0.88 at distal third,  $p=0.09$ ), stem varus or valgus position ( $p=0.08$ ), or distal stem-cortex contact ( $p=0.6$ ) between cohorts.

**Conclusions:** Patients sustaining an acute, periprosthetic fracture with cementless femoral fixation after THA had thinner distal cortices and a decreased meta-diaphyseal taper. Surgeons should be aware of the potential risk of periprosthetic fracture in patients with this specific morphology when performing a cementless THA.