Femoral Bowing in the Coronal Plane: A CT Analysis of 1313 International Femurs

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Purpose: Appreciation of sagittal bowing of the femur has led to optimization of implant design and placement techniques. However, little is known about femoral bowing in the coronal plane. Using CT, the authors sought to describe coronal bowing of the femur.

Methods: 3D models of 1313 left femurs from the Stryker Orthopaedic Modeling and Analytics database were analyzed. Coronal bowing was classified using radius of curvature. Univariable analyses were performed to detect associations between demographic characteristics and coronal bowing. Multivariable analyses were performed using scatterplots stratified by sex and with age-truncated spline regression curves overlaid to provide an empirical assessment and sex-specific Spearman correlation coefficients with P values.

Results: In total, 315 femurs (24%) had coronal bowing (Figure 1). Coronal bowing was strongly associated with age (P<0.001), sex (P<0.001), and ethnicity (P = 0.002) but not with body mass index (P = 0.54). Multivariable analyses resulted in positive correlations of coronal bowing with age that were stronger in females (Spearman's ρ = 0.42, P<0.001) than males (Spearman's ρ = 0.21, P<0.001).

Conclusion: This analysis demonstrated coronal bowing of the femur was strongly associated with age, sex, and ethnicity. Future studies are needed to characterize the clinical implications of these findings.

Figure 1. Coronal Bow Classifications

Coronal Shape	N (%)
Severe Medial Bow (ROC*, 0 to -150 cm)	2 (<1%)
Mild-to-Moderate Medial Bow (ROC, -150 to -300 cm)	35 (3%)
Straight (ROC <-300 or >300 cm)	994 (76%)
Mild-to-Moderate Lateral Bow (ROC, 150 to 300 cm)	236 (18%)
Severe Lateral Bow (ROC, 0 to 150 cm)	46 (4%)

*ROC, radius of curvature