

Defining the Optimal Coronal Plane Entry Point for Retrograde Femoral Intramedullary Nailing: A CT Analysis of 1316 Femurs

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Purpose: Retrograde intramedullary nailing is a very common treatment modality for appropriate femur fractures. There is significant variability in the orthopaedic trauma literature regarding the optimal starting point for retrograde femur nailing (RFN) in the coronal plane. Optimizing the ideal start point is vital to maintain adequate fracture reduction, particularly when treating distal third femur fractures. The objectives of this study are to describe the distribution of the optimal coronal plane entry point (OCPEP) in relationship to the intramedullary canal (IMC) for RFN and describe the association of age and gender with the OCPEP to help understand OCPEP variation.

Methods: Three-dimensional models of 1316 left femurs taken from the Stryker Orthopaedic Modeling and Analytics technology (SOMA, Stryker) database were analyzed using SOMA software. The anatomic axis was defined by best-fit circles through 7 points in 10% increments located in the center of the IMC. The point where this line fell relative to the center of the distal femur in the coronal plane was defined as the OCPEP. A ratio of OCPEP to femoral length (OCPEP:FL) was created to see if this reduced variation. The associations of age and gender with OCPEP and OCPEP:FL were assessed using linear regression including polynomial and interaction terms as well as spline curves.

Results: OCPEP had a positive skew with a median of 1.8 mm medial to the notch, IQR (interquartile range) from 0 to 3.7 mm, and 14% of patients having an OCPEP 1 mm or greater lateral to the notch (Fig. 1A). After standardizing by femoral length, OCPEP:FL was still not normally distributed (Fig. 1B). Increasing age was associated with increasing OCPEP in a non-linear fashion ($P < 0.001$) although gender was not strongly associated with OCPEP and did not significantly modify the association of age (Fig. 2A). The same associations were seen for OCPEP:FL (Fig. 2B).

Conclusion: This study demonstrates that the OCPEP is slightly medial to the center of the intercondylar notch. As patients age, the OCPEP becomes even more medial. This is clinically significant as the OCPEP can be used to help prevent malalignment during treatment of distal femur fractures.

Figure 1:

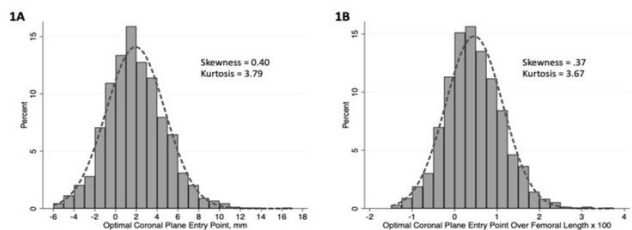
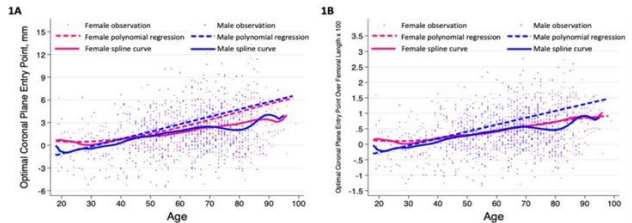


Figure 2:



The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device they wish to use in clinical practice.