Restoring Femoral Version in the Comminuted Diaphyseal Femur Fracture: A Radiologic Study Comparing Correction Methods in 219 Healthy Patients

Megan Anderson, BA*; Meera Dhopdapkar, MD; Nicholas Rhodes, MD; Jaimo Ahn, MD, PhD; Krystin Hidden, MD; Brandon Yuan, MD*

Purpose: In a comminuted diaphyseal femoral fracture, the restoration of appropriate femoral version (FV) can be one of the most challenging aspects of the reduction. Two primary methods of achieving rotational correction are commonly employed: matching the contralateral femur (MC) or correcting to a standard 15° anteversion (SC). This study assessed for differences in correction accuracy and rates of malrotation between MC and SC.

Methods: This retrospective radiologic study included all patients who underwent bilateral lower extremity CT between 2006 and 2024. Patients with a history of anatomy-altering femoral pathology were excluded. The left femur was theoretically considered as the “fractured” side. Its innate version, measured by CT, was the standard for a perfect rotational reduction. Two hypothetical FV corrections by technique were then calculated. SC assumed fractured FV correction to an anatomic average of 15° anteversion. MC theoretically matched the "fractured" FV to the contralateral uninjured side. FV after SC versus FV after MC was compared to known left FV by CT, and correctional error was calculated for each method. The proportion of femurs deviating from innate FV by more than 15° was recorded for SC and MC.

Results: In this study, 219 patients with a mean FV of 14.9° ± 10.5° anteversion were included (149 female [68%]; mean age, 34 years). Measures of FV did not differ significantly between left and right femurs. MC resulted in fewer degrees of malrotation for patients within 5° of cohort mean (5.0° vs 5.5°, $p = 0.042$), as well as for patients whose FV in the affected femur deviated at least 5° from cohort mean (5.5° vs 9.7°; $p \leq 0.001$). Significantly fewer femurs were malrotated by 15° with MC than with SC (4.6% vs 15.1%; $p < 0.001$).

Conclusion: In this radiologic study assessing two methods of FV correction using CT scans of healthy patients, MC to mirror the uninjured side resulted in less rotational error than SC to 15° anteversion, although differences may not be clinically significant. A 3-fold increase in the rate of malrotation >15° was observed with SC.