**Intraoperative Evaluation of the Anatomic Lateral Distal Femur and its Variation Due to Positioning**

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**Background/Purpose:** The complexity of management of distal femoral fractures varies widely but outcomes are directly related to quality of reduction as it relates to both articular congruity and coronal plane alignment. Preoperative evaluation of the contralateral anatomic lateral distal femoral angle (aLDFA) at our institution is used to judge coronal plane alignment. We have noticed significant variations of the aLDFA based on limb and C-arm position. Our hypotheses are that there is a most consistent position to evaluate the aLDFA, variation between patients and within the same patient will be significant, and that clinically significant malreductions may result despite matching the population average aLDFA or even the uninjured contralateral side.

**Methods:** 50 patients met inclusion criteria and enrolled in this prospective study. Inclusion criteria included lower extremity injuries needing fixation that would require intraoperative fluoroscopy with an intact distal two-thirds of the femur and an intact extensor mechanism. Fluoroscopic images were obtained of the distal femur in four positions differentiated by the position of the limb and the orientation of the C-arm beam to the femoral shaft (Images 1-4).

**Results:** There was significant variation from the population average of 81° using all of our measurements. We calculated the rate of variance of 3° and 5° and found a high rate of variability. Images 1 and 4 had 26%-28% of knees <78° or >84° (3° from 81°) and 4% of knees <76° or >86° (5° from 81°). Images 2 and 3 had 40% and 42%, respectively, over 3° and 10%-12% outside 5°. 70% of the extreme angles were in excessive valgus. Overall 96% of patients had at least one side-to-side difference of ≥3°, and 36% of patients had at least one side-to-side difference of ≥5°.

**Conclusion:** Reconstruction of the anatomic lateral distal femur angle is vital in fixation of fractures of the distal femur. This angle varies significantly between patients and even within the same patient. Our data have shown significant variability both within the same knee based on view chosen and between knees in the same person using the same projection. 48% of knees had a measured difference of 3° or more, and 12% had a measured difference of 5° or more comparing all images. One out of every eight patients could potentially result in a 5° malreduction despite perfectly matching a comparison image of the uninjured side with the use of imperfect imaging. Even with the most consistent imaging modalities, there is a 4% risk of significant malreduction matching the contralateral side.

Distal Femur Study Images

Image 1: Leg straight on the bed with C-arm vertical

Image 2: Leg placed on foam leg ramp with C-arm vertical

Image 3: Leg placed on foam leg ramp with knee extended and C-arm vertical

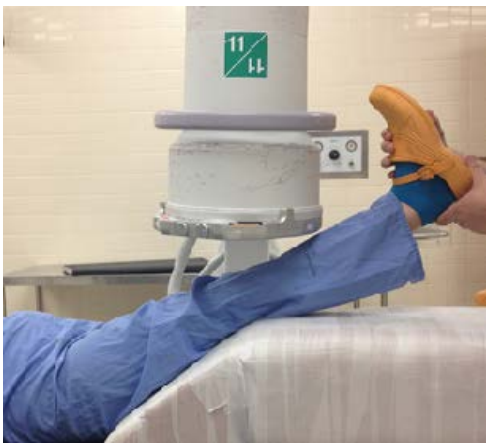

Image 4: Leg placed on foam leg ramp with C-arm perpendicular to femoral shaft

See pages 49 - 106 for financial disclosure information.