

Assessing the Accuracy of the Radiographic Ruler for Comminuted Femur Fractures: A Cadaveric Study

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INTRODUCTION: Fixation of comminuted femur fractures may result in limb length discrepancy. The determination of correct intramedullary nail length in the setting of comminution or bone loss often involves fluoroscopic measurement of the contralateral femur using a radiographic ruler. However, literature lacks evidence regarding the validity and accuracy of this technique. This study aimed to assess the accuracy of utilizing a radiographic ruler to recreate appropriate femoral length in a cadaver model of a comminuted diaphyseal femur fracture.

METHODS: Approximately 5cm of bone was removed from the left femoral diaphysis of 8 fresh frozen cadavers. A large diameter Steinmann pin was placed in each fracture gap to allow for adjustment of femoral length without affecting coronal or sagittal plane alignment. Nine blinded orthopaedic surgeons measured the contralateral, intact femur using a radiographic ruler, and then adjusted the length of the left femur until it matched the measurement of the contralateral femur. The resulting gap was then measured in millimeters (mm) and compared to the resected bone. Data were analyzed using means, standard deviations, and interobserver agreement.

RESULTS: A total of 57 measurements were collected from the participating surgeons. The mean difference between the resulting fracture gap and the initial gap created was 8 mm (standard deviation: 5.78, range: 0-22 mm). The measurements taken for the contralateral femur showed excellent interobserver agreement ($\kappa=0.98$).

DISCUSSION AND CONCLUSION:

This study supports the accuracy of a radiographic ruler to restore the length of a comminuted femur fracture to the uninjured side in a cadaveric model. We observed a mean difference of 8mm in the determined length of a femur compared to its original length as well as an excellent level of interobserver agreement in measuring the contralateral femur.

