Is It Healed? Clinical Measures of Fracture Healing Do Not Predict Unplanned Nonunion Surgery in Distal Femur Fractures

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Purpose: Historically, measures of success after distal femur fracture fixation have relied on radiographic outcomes. Newer instruments bridge the gap between radiographic union and functional outcomes by assessing "clinical union". The Function IndeX for Trauma (FIX-IT) score quantifies clinical healing by aggregating assessments of weightbearing and fracture site pain. We sought to determine the relationship between clinical healing, radiographic healing, and traditional functional outcome measures.

Methods: This secondary analysis of randomized controlled trial data included 167 adult patients with an OTA type 33A/C distal femur fracture recruited from 15 centers. Eligible fractures were treated with a bridging construct using a lateral locked plate (NCB Distal Femur plate, Zimmer Biomet USA) and randomly assigned to variations in construct. Outcomes were assessed at 6 weeks and 3, 6, and 12 months. Our primary comparison assessed time-specific correlations between clinical healing, measured by the FIX-IT score, and radiographic healing, measured by the RUST (Radiographic Union Scale in Tibia Fractures) score. Secondarily, we assessed time-specific correlations between clinical healing and physical function, measured with the Short Form-36 (SF-36). Finally, we constructed models to detect cut-points that optimized accuracy for predicting major reoperations using the RUST and FIX-IT scores at 6 weeks and 3 months.

Results: Correlations between RUST and FIX-IT scores were negligible at 6 weeks (r = 0.02) and 3 months (r = 0.12), improved at 6 months (r = 0.37), but diminished at 12 months (r = 0.19). Correlations between FIX-IT and SF-36 Physical Component Summary scores were initially weak but improved to become moderately stronger (r = 0.17 at 6 weeks, r = 0.39 at 3 months, r = 0.52 at 6 months, r = 0.59 at 12 months). Cut-points for the RUST score of 6 at 6 weeks (area under the curve [AUC] = 0.74) and 9 at 3 months (AUC = 0.90) showed reasonable accuracy in predicting major reoperation (0.75 and 0.80, respectively), with no improvement in performance with the addition of FIX-IT scores.

Conclusion: Despite the importance of ensuring a distal femur fracture has clinically and radiographically healed, there is limited concordance between these assessments. Moreover, radiographic healing is more predictive of reoperations than the patient-centered focus on clinical fracture healing.

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