

Using RUST and mRUST in the Distal Femur: The Same, but Different

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Purpose: The purpose of this study was to identify early, reliable radiographic predictors of uneventful union and conversely, factors that predict implant failure for distal femur fractures fixed with lateral locked plates.

Methods: Radiographs from a prospective cohort of 196 patients who sustained a distal femur fracture (OTA 33- A, B, C) and underwent open reduction and internal fixation with a lateral locked plate as part of an international, multicenter, randomized controlled trial were retrospectively reviewed by four fellowship-trained orthopaedic trauma surgeons. Radiographs were scored using the Radiographic Union Score for the Tibia (RUST) and the modified version (mRUST) at 6 weeks, 3 months, 6 months, and 1 year. Raters also made a gestalt determination of whether or not they thought the radiograph indicated the fracture was healed. We fit binary generalized estimating equations (GEE) models to identify thresholds for RUST and mRUST that corresponded to a fracture appearing healed. Using reoperation as a proxy for nonunion, we fit GEE models to identify scores at 6 weeks and 3 months that predicted eventual union. Finally, we computed Kappa statistics to determine the minimum number of bridged cortices best associated with complete union.

Results: Rater gestalt supports traditional interpretation of union using RUST and mRUST, with scores of 10/12 for the RUST and 12/16 for mRUST associated with a greater than 90% chance of the distal femur fracture being called healed. At 3 months, using RUST or mRUST to predict failure showed an inflection point between 5 and 6, with likelihood of failure clustered between 28% to 32% at 5 or less, and 12% or less at 6 or higher. This corresponds to the finding that, if at any timepoint, at least one cortex is deemed 'bridged' using the RUST score, there is a 98% chance of the fracture being deemed healed.

Conclusion: Scores of 5 or lower on the RUST and mRUST at the 3-month mark are associated with at least 30% and 28% risk of nonunion, respectively. Conversely, if at least one cortex was deemed 'bridged' using the RUST score, this corresponded to a 98% chance of union.