Validation of the Modified Radiographic Union Score for Tibia Fractures (mRUST) in Female Murine Femoral Fractures

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Background:

In the U.S, 1.1 million bone fractures require treatment each year. With bone fracture union predicting post-injury quality of life, investigation into therapies improving fracture outcomes is needed. Small animals like mice provide sound models of bone fracture healing. However, current in vivo methodology (μCT) assessing fractures in murine models is costly and may disturb fracture healing. The modified Radiographic Union Score for Tibia Fractures (mRUST) was developed to analyze human fractures efficiently using radiographs. This study hopes to demonstrate that mRUST provides comparable results to current standard measures of fracture healing in female murine models.

Methods:

In 135, 12-week-old female C57BL/6 mice, femur fractures were induced by surgical procedure. Lateral radiographs were taken directly after surgery along with lateral and anterior posterior images at 7,10,14,17, 21, 24, 28, 35, and 42 days post-surgery (n=15/group). At each time point, 15 mice were sacrificed, and their bones collected for μCT, histomorphometry, and biomechanical analyses. All radiographs will be randomized and assigned mRUST scores by orthopaedic surgeons blinded to groups. Callus and fracture line characteristics in four cortices of radiographs dictate mRUST scores. The level of correlation between mRUST scores and current measures of fracture healing will be calculated.

Results:

To date, all surgeries have been completed and all radiographs and specimens have been prepared for analyses. After analyses, statistical correlations between mRUST scores and μCT, histomorphometry, and biomechanics measures will be determined. We also plan to compare these findings to our previous findings with male mice to see if differences exist in fracture healing based on sex.

Conclusion:

Recently, our group validated using mRUST scoring in male murine models. We predict the same for female models. This will bolster the use of radiographs to assess fracture condition in mice, providing a relatively inexpensive tool for fracture therapy assessment.