

Biomarker to Endochondral Phase of Fracture Repair Demonstrates Differences Between Early and Delayed Long Bone Healing

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Purpose: The degradation product of collagen X yields CXM—an investigational biomarker associated with endochondral fracture healing and correlating to bone healing both in preclinical fracture models and clinical cohorts. Here we utilize recent criteria for dichotomization of fracture healing (<8 mRUST [modified Radiological Union Scale for Tibia] vs 9+ mRUST) to examine differences in patients and biomarker expression in normal and delayed healers.

Methods: Acute fracture patients (tibia/femur, shaft) were enrolled in IRB-approved observational cohorts. Blood, radiographs, and clinical records were collected longitudinally through care; radiographs were scored via mRUST. Patients were grouped according to mRUST at 3 months post injury: <8 “delayed”, ≥9 “normal” based on the work of Lee et al. CXM assay and clinical parameters were compared between groups.

Results: 40 patients (femur or tibia shaft fractures, 21 male) were observed and segregated based on mRUST score at 3 months (16 mRUST <8 “delayed” and 24 mRUST ≥9 “normal”). The groups were significantly different by patient age (normal healers: median 31 years, delayed healers: median 46 years; $P = 0.05$). Standard CXM metrics (days-to-peak, peak, delta-CXM) all approached but did not reach significance ($P = 0.23$; 0.19; 0.11) in exploratory analyses demonstrating longer time-to-peak, higher peak, and higher delta CSM in delayed healers.

Conclusion: CXM continues to offer insights into the mechanics of fracture healing.

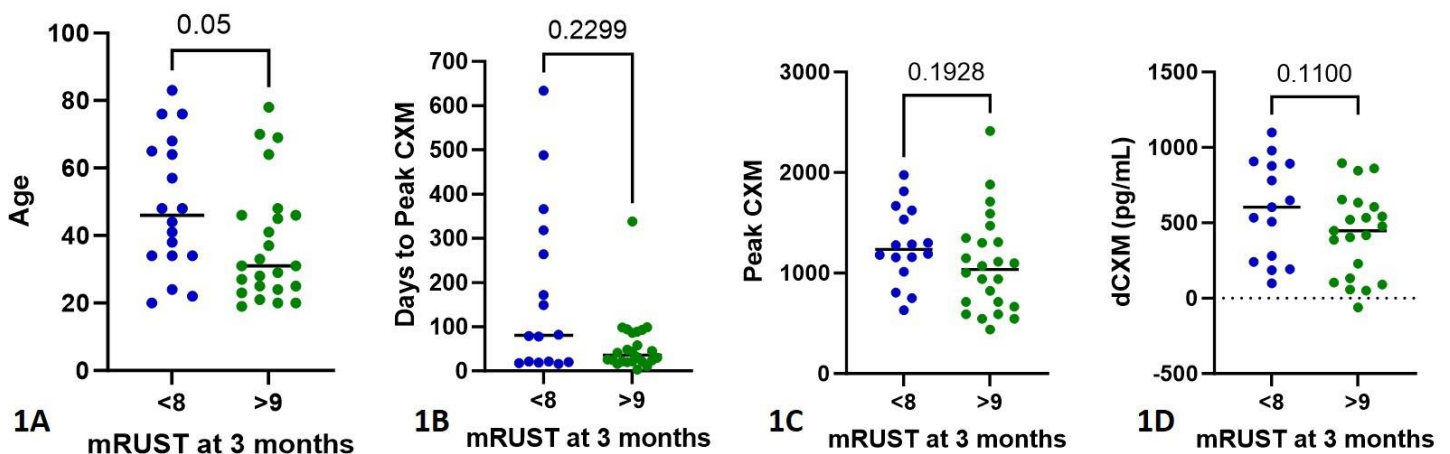


FIGURE 1: Segregation of patients with long bone fractures by mRUST score at 3 months yields fracture healing insights. **1A** – significant differences shown with delayed healers more likely to be older than normal healers. **1B/C/D** - exploratory analyses via standard CXM metrics show longer time to peak, higher peak, and higher delta CXM in patients with delayed healing patterns.