Scoring of Cortical Healing Predicts Union in Humeral Shaft Fractures

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Purpose: Humeral shaft fractures treated nonoperatively have a nonunion rate of 10%. Identifying patients with humeral shaft fractures that are going on to nonunion is important for patient counseling and delivery of effective care. The purpose of this study is to determine if a modified radiographic union score for tibial fractures (RUST) system is predictive of union in humeral shaft fractures treated nonoperatively.

Methods: All patients with long bone fracture nonunion presenting to a single surgeon were enrolled in a prospective registry. Enrolled patients were followed at regular intervals using the Short Musculoskeletal Function Assessment (SMFA), physical examination, and radiographic examination. This registry was queried to identify patients with humeral shaft fractures that were treated nonoperatively and went on to nonunion. The nonunion patients were matched to a three to one gender- and age-matched control group that achieved union. Two fellowship-trained traumatologists blinded to eventual union status scored radiographs obtained 12 weeks after injury using the radiographic humerus union measurement (RHUM) scoring system, which was previously validated at our institution in humeral shaft fractures treated nonoperatively. Differences in RHUM score were averaged. A binomial logistic regression was performed to determine the effect of RHUM score applied to humeral shaft fractures on the likelihood of developing union.

Results: Nine patients with humeral shaft fractures that were treated nonoperatively and went on to nonunion were identified. These patients were matched to 27 gender- and age-matched controls who achieved union. Logistic regression showed that the RHUM score applied to humeral shaft fractures was a significant predictor of healing ($P = 0.014$, odds ratio [OR] 9.434, 95% confidence interval [CI] for OR 1.586 to 56.098) after humeral shaft fracture treated nonoperatively. All patients with RHUM score below 7 went on to develop nonunion. All patients with RHUM score above 8 went on to union without further intervention. Three of 7 patients (43%) with RHUM score of 7 or 8 went on to union without further intervention.

Table 1:

RHUM Score	4	5	6	7	8	9	10	11	12
Union	0	0	0	1	2	7	9	5	3
Nonunion	1	0	4	1	3	0	0	0	0
Percent Union	0	0	0	50	40	100	100	100	100

Conclusion: The RHUM score applied to humeral shaft fractures showed an increased likelihood of achieving union with increasing RHUM 12 weeks after injury. Orthopaedic surgeons can counsel patients with fractures with RHUM scores of 6 or below that they are in danger of developing nonunion, scores of 9 or above should achieve union, and scores of 7 or 8 achieve union less than half of the time. This allows surgeons to target interventions appropriately.

POSTER ABSTRACTS