

Risk Factors for Failure to Achieve Functional Range of Motion after Nonsurgical Management of Proximal Humerus Fractures

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INTRODUCTION:

There is increasing interest in optimal management of proximal humerus fractures. While the majority can achieve successful functional outcomes with nonsurgical management, it remains unclear which patients are less likely to achieve satisfactory function with nonsurgical management and might benefit from early surgical intervention. The purpose of this study is to determine characteristics associated with failure to achieve functional range of motion (ROM) within the first year after nonsurgical management of proximal humerus fractures. We hypothesized that patients with higher comorbidity burdens and those with more complex fracture patterns would be less likely to achieve functional ROM.

METHODS:

Patients >60 years old who underwent nonsurgical management of a proximal humerus fracture with minimum 1 year of clinical follow up were reviewed. Shoulder ROM values were recorded from all follow-up visit documentation. Functional shoulder ROM was defined as achievement of >90° of active forward flexion (FF), as previously defined in the literature. Patient characteristics were recorded including sex, age, body mass index, smoking status, Charlson comorbidity index (CCI), and history of diabetes. Injury radiographs were reviewed to assess AO/OTA fracture classification and presence of calcar comminution. These characteristics were tested for associations with failure to achieve functional ROM within the first year post-injury. Bivariate Poisson regression with robust error variance was used to evaluate patient and fracture characteristics for associations with failure to achieve functional ROM.

RESULTS:

A total of 203 patients from 2015-2018 with nonsurgically managed proximal humerus fractures were identified. In total, 81% were female and the average age was 75 years. The majority of fractures were AO/OTA type 11A (46%) followed by 11B (34%) and 11C (20%). A total of 8 patients (4%) underwent a subsequent surgical intervention within 1 year of injury. In total, 65% of patients achieved functional ROM within the first year post-injury. Risk factors associated with failure to achieve functional ROM included age ≥80 years (49% vs. 73%, Relative Risk [RR]=0.7, p<0.01), CCI ≥5 (53% vs. 72%, RR=0.7, p=0.01), and AO/OTA type 11C fracture pattern (49% vs. 69%, RR=0.7, p=0.04). No other factors were associated with achievement of functional ROM (p>0.05, **Table 1**).

DISCUSSION AND CONCLUSION:

Older age (≥80 years), higher comorbidity burden (CCI ≥5), and type C (4-part) fracture patterns are risk factors for failure to achieve functional shoulder ROM within the first year after nonsurgical management of proximal humerus fractures. These risks should be considered during treatment decision making and may be useful for counseling patients on treatment options and anticipated outcomes.

Table 1. Bivariate analysis of factors associated with achievement of functional motion*

	Functional ROM [‡] Achievement Rate	RR	95% CI	tp-value
Total	64.5%			
Sex				
Female	63.6%	Ref.		
Male	68.4%	1.1	0.84-1.37	0.56
Age				
< 80 years	72.7%	Ref.		
≥ 80 years	49.3%	0.7	0.52-0.88	<0.01
Body Mass Index				
< 30 kg/m ²	67.4%	Ref.		
≥ 30 kg/m ²	58.3%	0.9	0.68-1.11	0.25
Smoking Status				
Non-smoker	64.6%	Ref.		
Smoker	64.0%	1.0	0.72-1.36	0.95
Charlson Comorbidity Index				
< 5	72.1%	Ref.		
≥ 5	53.1%	0.7	0.58-0.93	0.01
Diabetic Status				
No diabetes mellitus	63.4%	Ref.		
Diabetes mellitus	69.1%	1.1	0.86-1.38	0.47
AO/OTA Fracture Classification				
11A/11B	68.5%	Ref.		
11C	48.8%	0.7	0.51-0.99	0.04
Calcar Status				
Not comminuted	65.8%	Ref.		
Comminuted	59.5%	0.9	0.69-1.19	0.47

***Boldface** indicates statistical significance

[‡] Defined as >90° of active forward flexion

ROM = range of motion; RR = relative risk; CI = confidence interval; Ref. = reference

tp-value calculated using Poisson regression with robust error variance