Incidence, Risk Factors, Management, and Nonunions of Pediatric Scaphoid Fractures: A National Database Study

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INTRODUCTION: Scaphoid fractures represent a significant portion of wrist fractures in both the adult and pediatric populations. The incidence, risk factors, and management have been well-described in the adult population; nonunion rates have been estimated to be approximately 5%-25% and are typically managed surgically. Nonetheless, these factors have not been well-characterized for pediatric patients.

METHODS:

Pediatric patients (age <18) with acute scaphoid fracture were identified in the 2010-2023 PearlDiver M170 database. Patient and fracture characteristics, as well as any operative treatments, were extracted.

Fracture nonunion rate and predictive factors were then characterized with multivariate logistic regression. Among patients with nonunion initially treated nonoperatively, univariate analysis and multivariate logistic regression were conducted to compare characteristics of patients receiving surgical treatment as compared to those managed nonoperatively.

RESULTS:

Of 26,364 acute pediatric scaphoid fractures, 17,035 (64.6%) were male, average age was 13.54 years, average Elixhauser comorbidity index (ECI) was 0.96, and a large majority of patients had commercial insurance (79.4%). Of these fractures, distal one third fractures constituted 71.8%, middle third fractures constituted 0.7%, and proximal third fractures constituted 27.5%. Only 15.1% had displacement and 0.9% were open fractures. Additionally, 805 patients (3.1%) presented with at least one additional carpal or metacarpal fracture. Surgery was pursued as initial treatment for 4.1%.

Nonunion was noted for 1,113 patients (5.0%). Nonunion was associated with patient characteristics (older age [OR= 1.42 per year], male sex [OR=2.13], and overweight/obesity with body mass index > 25 kg/m^2or 95% for age [OR= 1.52]) and fracture characteristics (fracture displacement [OR=3.75], and fracture position [relative to distal, middle OR=1.71 and proximal 1/3 location OR=2.80]) ($p<0.0001$ for all). Of all patients with nonunion, 89.0% were diagnosed within 6 months of first diagnosis of fracture, suggesting delayed presentation to care.

Of those diagnosed with fracture nonunion, surgery was performed for 595 (71.8%). Factors independently associated with nonunion being elected for surgery were older age (OR=1.16 per year), late presentation to care (OR=1.87), and fracture displacement (OR= 2.12) ($p<0.0063$ for all, with Bonferroni correction applied).

DISCUSSION AND CONCLUSION: Scaphoid fractures in the pediatric population are characterized in a large patient cohort. Patient and fracture characteristics roughly mirrored adult populations, but nonunion rate was on the low end of the range described for adults. The occurrence of the large majority of nonunion diagnoses and related surgeries within only 6 months of initial fracture diagnosis suggests that most patients with nonunion present late to care and may be a factor contributing to nonunion.