

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

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Disclosures: Katie Zehner (8- Associate Editor of Visual Abstracts, North American Spine Society Journal), Julian Smith-Voudouris (N), Joshua G Sanchez (N), David Colen, Andrea Halim, Jonathan N Grauer (8- North American Spine Society Journal Editor-in-Chief, 8-Journal of the American Academy of Orthopedic Surgeons Deputy Editor, 9- North American Spine Society past board member)

INTRODUCTION: Scaphoid fractures represent a significant portion of carpal fractures in both adult and pediatric populations. While the incidence, risk factors, and management have been well-described in the adult population, these have not been well-characterized for pediatric patients.

METHODS: Pediatric patients (age <18 years) with scaphoid fracture were identified in the 2010-2023 PearlDiver M170 database. As all data in this database has been aggregated and deidentified, our institutional IRB has determined studies using this database to be exempt from review. Patient, fracture characteristics, advanced imaging, and any operative treatments were extracted.

Fracture nonunion rate and predictive factors were then characterized with multivariable logistic regression. Among patients with nonunion initially treated nonoperatively, univariable analysis and multivariable logistic regression were conducted to compare characteristics of patients converted to surgical treatment versus those not treated surgically.

RESULTS SECTION: Of 26,364 acute pediatric scaphoid fractures, 17,035 (64.5%) were male, with an average age of 13.54 years. Of these fractures, distal one-third fractures constituted 17.9%, middle third fractures constituted 18.0%, and proximal third fractures constituted 3.5%, with the remaining patients having location unspecified. Of those with presence or absence of displacement specified, 22.8% had displaced fractures. Additionally, 805 patients (3.1%) presented with at least one additional carpal or metacarpal fracture. MRI was utilized for 11.9% and CT for 8.7% for patients. Surgery was pursued as initial treatment for 4.1%.

Of pediatric patients diagnosed with scaphoid fracture, nonunion was noted for 1,102 patients (4.2%). Nonunion was independently associated with patient characteristics (older age [OR= 1.57 per year], male sex [OR=2.11], Midwest region [relative to Northeast, OR=1.45], overweight/obesity [OR= 1.52]), fracture characteristics (displacement [OR=2.45], and position [relative to distal, middle OR=2.18 and proximal 1/3 location OR=4.74]) (p<0.0001 for all). Of all patients with nonunion, 73% were diagnosed with nonunion within 3 months of first fracture diagnosis, suggesting delayed initial diagnosis.

Of pediatric patients diagnosed with scaphoid nonunion, surgery was performed for 784 (71.3%). Surgery for nonunion was independently associated with older age (OR=1.17 per year), late diagnosis (OR=2.10), and Midwest region (relative to West, OR=1.99) (p<0.0017 for all).

DISCUSSION: Pediatric scaphoid fractures were characterized in a large patient cohort. Patient and fracture characteristics roughly mirrored adult populations, with nonunion rate on the low end of the reported adult range. The occurrence of most nonunion diagnoses and related surgeries within only 3 months of initial fracture diagnosis suggests that many patients with nonunion present late to care. Significant differences in rate of nonunion and rate of surgical management by region suggest nonclinical factors such as ease of access to care impact treatment outcomes.

SIGNIFICANCE/CLINICAL RELEVANCE: (1-2 sentences): Clinical and nonclinical factors associated with nonunion in pediatric scaphoid fractures are identified, helping to identify patients who may be at greater risk of nonunion at the time of initial presentation. Further study is warranted to better understand and address disparities in care and reasons for late presentation.

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