SCIENTIFIC ARTICLE

Capitate Fractures: A Review of 53 Patients

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Purpose To describe the demographics, diagnosis, management, and outcomes of capitate fractures in the adult and pediatric population treated in our institution.

Methods We performed a retrospective chart and radiographic review of 53 patients with capitate fractures treated in our institution between 2002 and 2015. Patients' demographic characteristics, mechanism of injury, management including surgery-related data, and outcomes, including complications, were recorded. A radiographic evaluation of the location and pattern of the fracture was performed.

Results Capitate fractures were prevalent in young males and older females. Fracture location was variable with 9 different locations; in addition 80% of patients had an associated fracture in the wrist or hand. The most common fracture pattern was the transscaphoid, transcapitate perilunate dislocation. Most diagnoses were made with the aid of advanced imaging. Within this series, there was only 1 case (4%) of fracture nonunion and there were no cases of avascular necrosis of the proximal pole in limited follow-up. Isolated capitate fractures were significantly more common in children. In addition, children had better functional outcomes than adults.

Conclusions This series provides updated information on this rare injury. Nonunion of the capitate, which was previously described as the most common complication, was rare in this cohort. *(J Hand Surg Am. 2016;■(■):■−■. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Capitate fracture, nonunion, avascular necrosis, scaphocapitate syndrome, perilunate dislocation.

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Fractures of the capitate bone are rare and comprise about 1% to -2% of all carpal fractures.[1] Although capitate fracture can occur in isolation, most fractures occur in conjunction with other carpal fractures, most notably with perilunate "greater arc" fracture patterns.[2–4] The scaphocapitate syndrome is a rare greater arc injury in which the scaphoid and capitate fracture and the proximal capitate fragment rotates 90° to 180° in the sagittal plane.[5,6]

Management of capitate fractures depends on the fracture pattern and the presence of other carpal fractures. In general, cast immobilization is indicated for nondisplaced fractures, whereas displaced or comminuted fractures require surgical fixation with either pinning or a headless screw.[1]

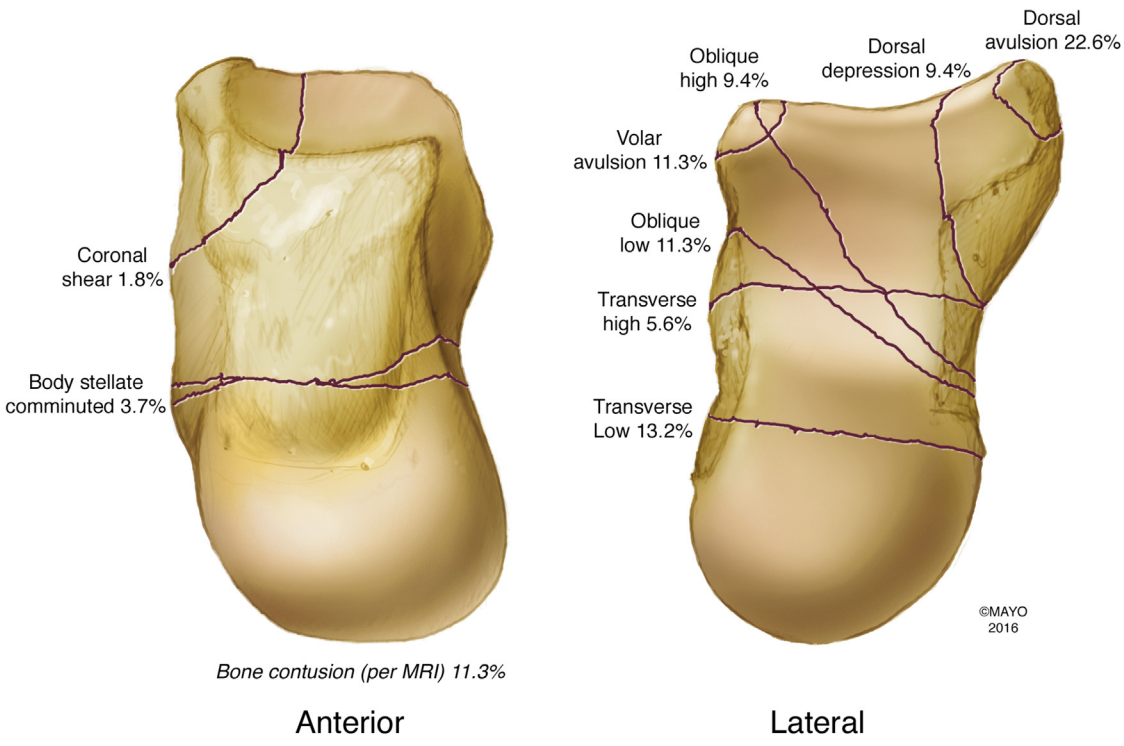

FIGURE 1: Location of fracture in the capitate bone. (Reprinted with permission from Mayo Foundation for Medical Education and Research. All rights reserved.)

The most commonly cited complications of capitate fractures are nonunion and avascular necrosis of the proximal pole.[3,7,8] Rand et al[3] reported a nonunion in 4 out of 13 patients in their case series. Studies have related those complications to the retrograde pattern of blood supply in the capitate, which renders the proximal capitate avascular in cases of capitate body fracture.[9]

The capitate is the second most commonly injured carpal bone in children, but it has been reported to rarely occur as an isolated carpal fracture.[10] Diagnosis of this injury is especially difficult in children owing to the partial ossification of the carpal bones. This injury can be treated surgically or nonsurgically, depending on severity, similar to the adult population.

Our knowledge of capitate fractures relies mostly on small case series.[3,11] The aim of our study was to further investigate the results of surgical and nonsurgical treatment, assess the effectiveness of contemporary imaging, and assess rates of complications, specifically nonunion.

METHODS

The study is a retrospective case series of patients who were treated in our institution for capitate fracture between 2002 and 2015.

Following approval of the institutional review board, a dataset of patients with capitate fracture was created with the Advanced Cohort Explorer software (Mayo Clinic, Rochester, MN). The terms searched were "Capitate fracture," "fracture of the capitate," "Scaphocapitate syndrome or fracture," and "Capitate" among patients with a diagnosis of carpal bone fracture (International Classification of Diseases, Ninth Revision, codes 814.0 and 814.1). These terms yielded 349 results, of which 53 patients were confirmed to have capitate fractures by reviewing their charts and radiographs.

Patients' medical records were reviewed for demographic characteristics, mechanism of injury, type and pattern of fracture, and associated injuries to the wrist. Mechanisms of injury were classified into high- and low-energy injury. Medical records were also reviewed for the treatment that was provided to the patient with any associated surgical details. Plain radiographs of all 53 patients were reviewed to determine the type and pattern of fracture and associated carpal fractures. Fifty patients had also had an advanced imaging study performed (either computed tomography [CT] or magnetic resonance imaging [MRI]).

Patients' medical records were reviewed for range of motion and pain at the latest follow-up. Because the evaluation of the patients was performed by different surgeons and at different intervals, we have broadly classified the wrist range of motion as functional ($>$ 40° of flexion and 40° of extension[12]) or nonfunctional. Patients were assessed for complications