Nonunion of capitate due to late diagnosis in a teenager

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Patient: Male, 13
Final Diagnosis: Isolated capitate bone fracture
Symptoms: —
Medication: —
Clinical Procedure: —
Specialty: —

Objective: Unusual clinical course
Background: Carpal fractures often appear in men under the age of 40 years. Isolated fracture of the capitate without dislocation is very rare and comprises 1% of all carpal fractures. Nonunion of capitate mostly resulted from delay in diagnosis and lack of initial treatment.

Case Report: We reported the case of a 13-year-old boy who had a late-diagnosed capitate fracture. We put the wrist in a short-arm cast for 3 months. After the immobilization with the cast has been finalized, range of motion and strengthening exercises were started. One year after the trauma, we saw total union of the fracture.

Conclusions: Diagnosis of carpal bone fracture may be missed, especially in skeletally immature patients. To prevent late diagnosis in skeletally immature patients, early control radiography should be taken. If further examination is needed, computed tomography should be performed. We can achieve good results with cast immobilization in this age group of patients. As a result, although the author has been advised surgical treatment for nonunion of capitate fracture, conservative treatment should be considered.

MeSH Keywords: Capitate Bone • Nonunion • Carpal Bones – injuries

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Background

Carpal fractures often appear in men under the age of 40 years [1] and most commonly occurs after falling on an open hand. While scaphoid fractures are mostly seen, capitate fracture occurs very rarely [2].

The capitate is the largest of 8 carpal bones and is at the center of them [3]. The center of rotation of the wrist passes through the head of the capitate bone [4]. Isolated fracture of the capitate without dislocation is very rare and comprises 1% of all carpal fractures [5–7].

Nonunion has been reported as the most common complication; 19.6% to 56% in isolated capitate fractures [8,9]. Nonunion mostly results from delay in diagnosis and treatment [7,8,10]. Isolated and nondisplaced capitate fractures are successfully treated with cast immobilization [11]. Displaced fractures should be reduced anatomically and fixed with K-wires or Herbert screws [12–14]. In the literature, surgery is advised for the treatment of nonunion capitate fractures [8,15,16].

We present a case with nonunion of a capitate fracture, which was successfully treated conservatively.

Case Report

We report the case of a 13-year-old boy who fell on his left hand and went to the emergency clinic, where radiographs were taken but no fracture was seen. Elastic bandage was applied, a non-steroidal anti-inflammatory drug was prescribed, and

Figure 1A,B. A transverse fracture line and sclerosis in the middle of the capitate at X-ray (AP and Lateral view).
cold application was advised. The patient was called to come for a control examination 1 week later, but he did not appear. After 6 months, the patient came to the orthopedic clinic because his symptoms were unimproved.

At physical examination, we determined edema and pain with palpation of the capitate bone. Wrist range of motion was nearly full but the final stage was tender. There was no tenderness on scaphoid with palpation, Watson test, LT test, and Lichtman test results were negative. There was no evidence of compression of the median nerve.

Upon X-ray examination, we saw a transverse fracture line and sclerosis in the middle of the capitate (Figure 1). Computed tomography (CT) clearly showed the nonunion (Figure 2). X-ray and CT failed to show any other pathology.

We advised the surgical treatment for nonunion. However, the patient rejected the surgery, so we put the wrist in a short-arm cast for 3 months. After the immobilization had been finalized, range of motion and strengthening exercises were started. One year after the trauma, we saw total union of the fracture (Figure 3), edema had completely regressed, wrist range of motion was full and painless [80° flexion, 70° extension, 20° radial deviation, and 30° ulnar deviation] and grip strength was equal in both hands. The patient was followed for post-traumatic arthritis.

Discussion
Fractures of the capitate are a rare injury, especially in children, are usually missed entirely, and account for only 0.3%
of all carpal fractures. Most of these fractures occur in association with additional carpal injury, particularly scaphoid fractures. This is usually the result of a high energy trauma [6,17–19]. Isolated capitate fractures usually occur after falling on an open hand [6].

Capitate fractures are often missed entirely because the initial radiographies of nondisplaced fractures are usually nondiagnostic. CT is very helpful for diagnosis of isolated fractures. MRI is helpful in showing avascular necrosis and for deciding whether there is union or nonunion [4,6].

The complication rate for capitate fractures is relatively high and consequences are important [4]. Functional limitation is common secondary to nonunion, avascular necrosis of the proximal pole, capitate collapse, symptomatic midcarpal arthritis, or associated injuries [7].

The outcome and the treatment modalities of isolated capitate fractures are not well determined. The orthopedists concurred with conservative treatment with initial cast immobilization (generally 6 to 12 weeks of immobilization), followed by mobilization within pain limits, because the displacement was minimal and the fracture fragment was small and not rotated [4,20].

Displaced fracture of the capitate requires anatomic repositioning and internal fixation with headless cannulated compression screws or K-wires [21]. The headless compression screw has advantage over the K-wire because it provides compression across the fracture site and allows early wrist exercise [22].

Nonunion has been reported as the most common complication; 19.6% to 56% in isolated capitate fractures [8,9]. Nonunion mostly results from delay in diagnosis and treatment. Nonunion can be treated with intercalary bone grafting and/or open reduction and internal fixation [7,8,10]. Our case was a misdiagnosed capitate fracture initially diagnosed as a soft-tissue injury. The patient did not come for control examination, so diagnosis of the fracture was delayed. Gehrmann et al. [15] reported a case with nonunion of a capitate fracture treated with an iliac cancellous bone graft and screw osteosynthesis. Bone healing was verified 3 months after surgery and they recommended operative treatment for delayed union. Morisawa et al. [16] reported another case, in which the bone with a nutrient vessel was grafted; bone union and excellent results were obtained. In our case, after immobilization with a cast, we achieved union and excellent results. We treated our late-diagnosed capitate fracture case conservatively due to refusal of surgical treatment by the patient. Union was achieved with cast immobilization after 3 months. At last examination, there was full range of wrist motion without pain.

Conclusions

Carpal bone fractures may be under-diagnosed, especially in skeletally immature patients. If complaints persist, control radiographies should be taken as soon as possible. If further examination is needed, CT should be performed. Surgery is the recommended treatment for nonunion of a capitate fracture. However, patient age should be taken into account because cast immobilization may be a good treatment choice for preadolescents.

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