

# Delayed Union of Fracture Capitate in A Two Years Old Child



Mohamed Abou Elatta<sup>1\*</sup>, Hussam M Basheer<sup>2</sup>, Ahmed F El Morshidy<sup>3</sup>

<sup>1</sup>Specialist of hand and microsurgery, Alrazi hospital, Kuwait

<sup>2</sup>Consultant and head of hand and microsurgery unit, Alrazi hospital, Kuwait

<sup>3</sup>Consultant of hand and microsurgery, Hand unit, Al-Razi hospital, Kuwait

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**\*Corresponding author:** Mohamed Abou Elatta, Specialist of hand and microsurgery, Alrazi hospital, Kuwait, Email: mmaboaalatta03@yahoo.com

## Abstract

Two years old child presented with severe hand swelling after a heavy object was fall on him. Entail X rays was unclear but the following x rays and magnetic resonance image was diagnostic. Open reduction and fixation by Kirschner wire was used for treatment. Whether the union was achieved after 2 years post-operative, but the range of motion and the hand grip was about 95% of the contralateral healthy side.

**Keywords:** Capitate fracture carpal; Fractures children fractures; Delayed union; Open reduction; Fixation

## Introduction

Fractures of the carpal bones are quite rare in skeletally immature patients. Fracture Capitate is less common than fracture scaphoid [1]. Fracture Capitate may occur alone or associated with other carpal fractures. Capitate fracture may associate with Scaphoid fracture as a part of Scapho-Capitate syndrome (Fenton syndrome) [2,3] or fracture hamate [4]. Computed tomography (CT) and magnetic resonance imaging (MRI) are quite important in establishing the diagnosis because conventional radiography may be inadequate [4,5,11]. Conservative treatment is indicated for non-displaced or minimally displaced Capitate fracture, while open reduction and kirschner wire fixation is indicated for displaced fracture [3].

## Case Report

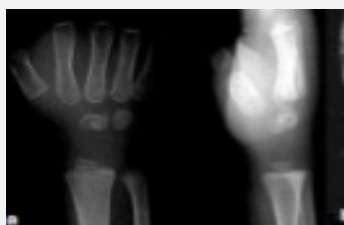


Figure 1: X-ray 4<sup>th</sup> day of the trauma.

Two years old male child was admitted in our hospital 3 days after a cupboard was fall on him. He had fracture both right bones leg with sever ipsilateral hand and wrist swelling. Initial wrist radiographs were inconclusive. (Figure 1) MRI was requested but was done on the 10<sup>th</sup> day post-trauma (Figure 2). It showed a displaced fracture of the Capitate. On the 15<sup>th</sup> day

post-traumatic open reduction and internal fixation was carried out. Through a transverse skin incision, retracted the long extensors, then the wrist capsule was incised longitudinally. A displaced fracture of the Capitate and un-displaced fracture Hamate was found. Capitate fracture reduced and fixed with 2 smooth K. wires (Figure 3). The capsule is repaired. A slab was applied for 30 days (Figure 4). K wires were removed on the 35 days post-operative. Regular follow up visits were scheduled, and physiotherapy was started. As most of the Capitate is cartilaginous, repeated radiographs were difficult to assess, signs of non-union appeared at 6 months. Conservative approach was agreed on with family. After 24 months after operation radiographic union was achieved (Figures 5-7).

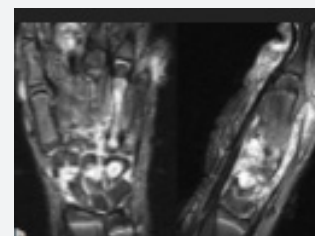


Figure 2: MRI sagittal and coronal views.

The union was achieved 2 years postoperative but the patient during this period had good painless range of motion. The wrist extension and ulnar and radial deviation was the same as the contralateral wrist while the wrist flexion is about 95 % of the contralateral side. The hand grip was about 93% of the contralateral side.



Figure 3: Intra-operative photos for displaced and after reduction.



Figure 4: Post-operative x-ray.



Figure 5: 2 Months post-operative X-ray.



Figure 6: 6 Months post-operative X-ray showed delayed union.

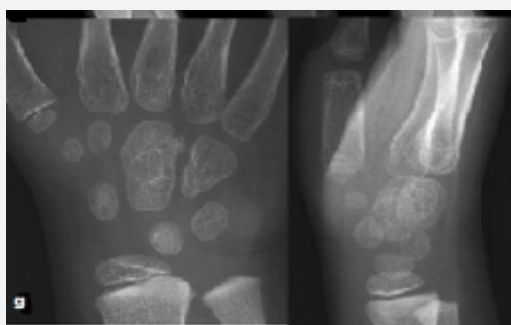


Figure 7: Union at 24 months post-operative.

## Discussion

Carpal injuries in children are relatively rare. The Scaphoid is most susceptible to injury incidence is about 0.39%. The fracture Capitate is the 2<sup>nd</sup> common carpal bone fracture which often

presents in association with other carpal bone injuries. Other carpal bone fractures are very unusual [1,3,4,7,8,10,11]. Most of the cases described were fractures the Capitate in association with fracture Scaphoid as a part of Scapho-Capitate syndrome which was first described by Fenton [2, 3,11]. Fracture Capitate in association with hamate was also reported [4].

Carpal bones are largely cartilaginous at birth and remain largely cartilaginous until late childhood. Such a cartilaginous structure acts as a cushion to protect the carpal bones from fracture in small children. At the end of second year, only the Capitate and the Hamate are ossified [6]. Diagnosis is likely to be missed, or the severity of the injury might not fully be appreciated at the time of presentation [1]. Conventional radiography may be inadequate for the diagnosis or may lead to misdiagnosis [11]. The cartilaginous components of the carpal bones or fractures of the carpal bones can be visualized by ultrasonography, CT, scintigraphy, and MRI. However, ultrasonography is not commonly used for the diagnosis of fractures, except for displacement of un-ossified epiphyseal cartilage [1,9]. MRI scan is a sensitive, reliable and quite important technique for detecting carpal bone injuries in children, in whom osseous development is progressing and the cartilaginous structure is predominant, particularly when there is a clinical suspicion. MRI may demonstrate bone marrow changes and cortical disruption and can clearly delineate fracture lines, particularly if the imaging is performed in more than one plane [9,11]. MRI has the advantage of detecting associated soft-tissue changes around the wrist joint and joint effusions between the carpal bones and may be beneficial in evaluating the vascularity of the fracture fragments. MR sensitivity was 100% with a specificity of 92% [4,7]. CT may play a role in case of complex fractures, Osteochondral lesions and can assist surgical planning by providing detailed depiction of the position and alignment of fracture lines and fracture fragments [7]. Generally, most of pediatric carpal injuries heal uneventfully with simple cast immobilization, which is indicated for non-displaced or minimally displaced Capitate fracture in children [8] Kuniyoshi et al. [8] reported a case of oblique fracture of the Capitate with a displacement of 5 mm on the lateral view, which was successfully treated with immobilization. During follow-up, the Capitate showed marked remodeling and at four and a half years after injury it had regained an almost normal shape. Eleven years after injury, there were no radiographic changes such as malalignment or arthrosis in the carpal bones.

Displaced Capitate fractures require open reduction and percutaneous K-wire fixation [4]. Obdeijn et al. [4] published case of fracture Capitates and Hamite, the Capitate was treated by dorsal approach and reduced the Capitate anatomically and fixed with 2 K-wires leaving the skin outside and removed in 6 weeks while the Hamite was treated conservatively. Kai et al. [9] reported an eleven years old girl had fracture Capitate in association with Scaphoid fracture (Scapho-Capitate syndrome) and fracture distal radius and ulna but the proximal part of Capitate was rotated 180 degrees. The injury was treated by

open reduction and internal fixation. The patient had a full range of motion of the wrist, as well as full pronation and supination of the forearm with no signs of avascular necrosis after 1-year post-operative.) Fractures of the scaphoid, the Capitate, and the Hamate were treated with wire fixation, leading to good clinical results twenty-nine months after surgery [10].

Fujioka et al. [3] reported a nine-year-old boy had fracture scaphoid and Capitate. The patient was treated conservatively with a cast for two months. Fracture of the Capitate healed; however, fracture of the scaphoid resulted in non-union. They treated scaphoid non-union with an iliac bone graft and internal fixation. Three years after surgery, the patient had neither complaints nor complications and union of the scaphoid was confirmed on the radiographs. We treated a 2 years old child who had a displaced fracture Capitate in association with fracture Hamate in place by open reduction and k. wire fixation. The union of Capitate was achieved 2 years post-operative. Although the fracture did not unite initially but it remained un-displaced, probably by fibrous union the united fully at 2 years. We recommend to treat such cases by open reduction and fixation but keep wires for longer period more than one and half months and do not hurry to re-operate the such cases of delayed union in such age.

### Statement of Informed Consent

Even though there was no identifying details about the patient in this study, informed consent was obtained from patient for being included in the study.

### Conflict of Interest

All the authors declare that he has no conflict of interest.

### Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. Informed consent was obtained from all patients for being included in the study.

### Ethical Approval

This study was approved by our institutional review board.

### Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

### Statement of Informed Consent

No identifying information about participants is available in this article; all the data obtained from the Pediatric Health Information System database were de-identified.

### Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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