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Isolated Dislocation of Hamate with Hook Fracture in Setting of Acute Hand Compartment Syndrome: A Case Report and Review of the Literature

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Learning Point of the Article:

Traumatic, isolated hamate dislocation is associated with high-energy mechanisms of injury and should increase clinical suspicion for compartment syndrome.

Abstract

Introduction: A rare case of traumatic, isolated dislocation of the hamate with hook fracture in the setting of concomitant acute hand compartment syndrome is presented. This is the first described case of isolated hamate dislocation presenting with symptoms and examination consistent with acute compartment syndrome of the hand.

Case Report: A 28-year-old man presented with a left hand crush injury. Plain radiographs demonstrated an isolated dorsal hamate dislocation without axial carpal dislocation and volar displacement of the hook fracture segment. Due to the clinical diagnosis of compartment syndrome, the patient was taken urgently to the operating room. Closed reduction of the hamate was performed, fasciotomies were performed, and the hamate was stabilized with percutaneous pinning. The patient at 6 months had full clinical recovery and returned to work.

Conclusion: Isolated, traumatic dislocation of the hamate is a rare injury that is most commonly caused by direct impact to the wrist at the level of the carpus. This injury can be readily diagnosed by history, physical examination, and radiographs. Computerized tomography scan may aid in diagnosis, but delay in treatment should not be tolerated in emergent cases. Importantly, crush injuries with a resulting hamate dislocation should increase clinical suspicion for hand compartment syndrome. If diagnosed and treated expediently, patients may benefit from improved and excellent outcomes.

Keywords: Hamate dislocation, hand compartment syndrome, hand fasciotomy, hook fracture

Introduction

Isolated traumatic dislocation of the hamate is a rare injury first described in 1882 by Buchanan [1]. Since that time, only eight other cases have been reported in the literature [2, 3]. The mechanism of injury is typically due to direct impact, including crush injuries, but no reports describe the development of concomitant hand compartment syndrome. We present a case of a patient treated at our institution who presented with clinical signs of acute hand compartment syndrome in the presence of an isolated dislocation of the hamate with hook fracture. We further discuss mechanism of injury and treatment options and perform a current review of the literature.

Case Report

A 28-year-old healthy left-handed man was transferred to our emergency room 6 h after having his left hand crushed once in a box flattening machine at a winery warehouse. He reported increasing severe left hand pain, numbness, and difficulty moving his fingers and wrist. On physical examination, the patient had a diffusely swollen left hand with firm compartments. He had significant tenderness throughout and a palpable mass on the dorsum of his hand at the ulnar border. He maintained his hand in the intrinsic minus position and experienced extreme pain with passive stretch of his digits.

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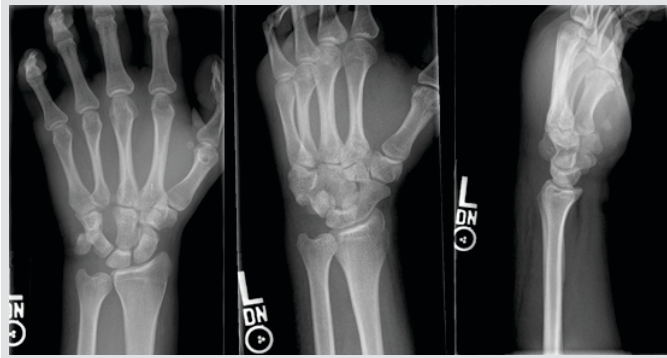


Figure 1: Radiographs demonstrating injury pattern including hamate dislocation and hook of hamate fracture.

There was a palpable radial pulse with 2–3 s capillary refill of each distal digit. He had significantly increased pain with passive extension of all four fingers and thumb. He described paresthesia and decreased sensation to light touch in ulnar, median, and radial nerve distributions of the left hand. Two-point discrimination was not intact up to 15 mm on the radial or ulnar border of all five digits. X-rays from the transferring hospital were available for review which demonstrated an isolated dorsal ulnar dislocation of the hamate with a volarly displaced hook fracture fragment. There was no metacarpal fracture, and the metacarpals did not dislocate dorsally and ulnarly with the hamate body (Fig. 1).

Due to the presentation consistent with acute compartment syndrome of the left hand, the patient was immediately taken to the operating room. The dislocated hamate could be palpated on the dorsum of the hand. Using radial and downward pressure, while the wrist was flexed and brought into extension, the hamate was reduced with a palpable clunk and concentric reduction of hamate capitate and hamate metacarpal joints was



Figure 3: Post-operative radiographs at 6 months after the removal of Kirschner wires along with clinical photos demonstrating wrist range of motion.

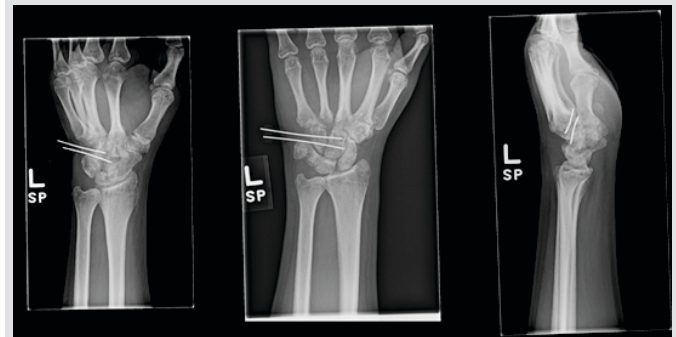


Figure 2: Immediate post-operative radiographs demonstrating fixation of hamate to capitate with 1.5 mm Kirschner wires.

confirmed on fluoroscopy. Two diverging 1.5 mm Kirchner wires were inserted under fluoroscopy guidance to stabilize the hamate to the capitate without violating the scaphoid (Fig. 2). Then, a standard carpal tunnel release was performed without evidence of the hook of the hamate being incarcerated. Finally, the standard fasciotomy release of all 10 compartments of the left hand was performed through two dorsal incisions to release the dorsal and volar interossei compartments and two volar incisions for the hypothenar and thenar compartments. All the wounds were irrigated, and the carpal tunnel release incision was closed, while the fasciotomy incisions were left open and covered. The patient was placed in a splint in the intrinsic plus position. He had a full return of sensation and resolution of pain on re-examination 1 h later. Four days later, the patient returned to the operating room for the closure of his wounds, and the splint was discontinued. At 6-week clinic follow-up, the wounds had fully healed, the Kirschner wires were removed, and he was referred to hand therapy. At 6-month clinic follow-up, the patient’s left hand had no neurologic deficits, and the patient had restored the full range of motion of his fingers and wrist (Table 1 and Fig. 3). Radiographs at his 6-month clinic follow-up demonstrated a reduced hamate bone with mild widening of the hamate capitate joint and 3–4 metacarpal interspace (Fig. 3). However, the patient was pain free with no evidence of instability on history or physical examination and no

Table 1: Physical examination range of motion of wrist and hand

Movement	Injured wrist/hand	Contralateral wrist/hand
Wrist flexion	60°	Equal
Wrist extension	60°	65°
Wrist ulnar deviation	20°	Equal
Wrist radial deviation	15°	Equal
Finger flexion	Able to make full fist	Equal
Finger extension	Able to fully extend	Equal

tenderness to palpation.

Discussion

Isolated dislocation of the hamate is a rare injury with only eight cases described in the literature to date [1, 2, 3, 4, 5, 6, 7]. To the best of our knowledge, this is the first described case of isolated hamate dislocation presenting with symptoms and examination consistent with acute compartment syndrome of the hand.

It is important to note that this injury differs from a traumatic perihamate axial carpal dislocation. A traumatic axial carpal dislocation is defined as a global disruption of the carpal, and metacarpal transverse arches of the hand with the normal convex relationship between the metacarpals head being lost [8]. The injury described in this report demonstrates a completely maintained metacarpal arch with intact convexity of the metacarpal heads. Furthermore, in this injury, the carpal relationships remain intact except for the isolated hamate dislocation. The mechanism of injury is typically a direct impact on the carpus with the subsequent dislocation occurring volar or dorsal depending on the vector of the force [4]. This contrasts with the more common hamatometacarpal fracture-dislocation which is due to an axial force such as a clenched fist striking an unyielding object [5]. The direct impact on the hamate may rupture the surrounding ligaments and depending on the integrity of the transverse carpal ligament (TCL), the hamate may be dislocated dorsally if the TCL is ruptured or may be pulled palmarly if the TCL remains intact [4]. The force of injury can vary, but in the presence of a crush mechanism with direct impact great enough to cause a hamate dislocation, there should be increased index of suspicion for the possible development of hand compartment syndrome.

The diagnosis of a hamate dislocation can be easily made on posterior-anterior and lateral radiographs of the wrist. A recent report states that computed tomography (CT) is essential for the initial workup of isolated hamate dislocation [5]. However, the description of the use of CT scan for diagnosis has not been described in the previous reports [1, 2, 3, 6]. In this case, the diagnosis of hamate dislocation was clear on plain radiographs. Furthermore, we felt that delay of treatment to obtain further imaging in the presence of a presentation consistent with acute compartment syndrome would have been ill-advised.

The reported outcomes of the treatment of hamate dislocation vary. Previously described treatments include observation, excision, closed reduction with splinting, closed reduction and percutaneous pinning, and open reduction with or without fixation [2, 3, 5, 6, 7, 9]. Outcomes have varied from a significant loss of function to no residual symptoms or functional deficits. A review of the literature demonstrates that this injury can be successfully treated closed if reduction is possible or open if

closed reduction is not possible [2, 3, 5, 6, 7, 9]. Poor outcomes tend to be due to delay in diagnosis [2, 3]. Due to the rarity of the injury, no definitive recommendation can be made regarding treatment as treatment decisions are often made based on concomitant injuries and time to diagnosis. It appears that most isolated dislocations can be treated with closed reduction with percutaneous fixation and open surgery is typically reserved for more complex or irreducible cases. The hook of hamate fracture fragments may be excised or observed, depending on the patient's symptoms and amount of displacement, for example, patients with continued hypothenar pain or weakness with activities that require tight grip, especially in ulnar deviation such as golf, may benefit from excision or fixation [10]. Furthermore, a displaced, non-united hamate hook poses a risk for potential future flexor tendon rupture [10]. For our patient, treatment timing and strategy were determined by the presence of acute compartment syndrome. Due to the need for urgent fasciotomies, our patient was taken immediately to the operating room. Because closed reduction was successful, an open approach to the hamate was unnecessary. Most importantly, the concentric reduction was stable after Kirschner wire fixation. This allowed for an early range of motion after the closure of the patient's fasciotomy wounds, resulting in the return to near full range of motion of the wrist without residual instability or pain.

Conclusion

We conclude that isolated, traumatic dislocation of the hamate is a rare injury that is most commonly caused by direct impact to the wrist at the level of the carpus. This injury can be readily diagnosed by history, physical examination, and radiographs. CT scan may aid in diagnosis, but delay in treatment should not be tolerated in emergent cases. Importantly, crush injuries with a resulting hamate dislocation should increase clinical suspicion for hand compartment syndrome. Multiple treatment options exist for hamate dislocations. The injury described here benefited from a preferable closed reduction and percutaneous fixation. If diagnosed and treated expediently, patients may benefit from improved and excellent outcomes.

Clinical Message

Traumatic, isolated hamate dislocation is associated with high-energy mechanisms of injury and, therefore, should increase clinical suspicion for compartment syndrome. If treated in a timely manner with reduction and stabilization, outcomes can be favorable.

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