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Case Report

Non-union in a hook of hamate fracture of a skeletally immature baseball player

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ABSTRACT

An isolated hook of hamate fracture is an extremely rare condition in skeletally immature patients. Early diagnosis and treatment are vital for the functional outcome of athletes such as baseball players. The hook of hamate fracture may be missed at initial presentation due to nonspecific symptoms and false-negative radiographs, which may eventually lead to a nonunion. Currently, there is no clear indication of surgical intervention for nonunion of the hook of hamate in a skeletally immature patient. This report presents the case of a twelve-year-old skeletally immature male with a hook of hamate fracture who underwent surgical bone fragment excision three months after initial injury due to a nonunion of the hamate bone. At the two-year post-operative visit, excellent results were obtained, and patient was able to continue his sports activity without any functional impairment.

Introduction

Hook of hamate (HoH) fractures are infrequent in the general population [1–3]. They are commonly presented in skeletally mature (SM) individuals who perform athletic activities such as golf, baseball, or racquet sports [1,2]. Direct compression, forceful grip, microtrauma, shearing forces or their combination, are some of the mechanisms that have been associated with injury to the HoH [1–3].

Fractures of multiple carpals, including the hamate bone, has been described in limited reports of skeletally immature (SI) patients [4–6]. Due to its rarity, there is no consensus for HoH fracture treatment among SI individuals. Thus, the aim to report an isolated HoH fracture nonunion in a SI baseball player who was successfully treated with a HoH bone fragment excision with excellent functional outcome.

Case history

A twelve-year-old right-handed Hispanic male presented to our orthopaedic hand clinic with chronic intermittent pain at his left

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wrist. He recalls an injury to his wrist three-months prior to our evaluation, after hitting the ball in a baseball practice. Immediately afterwards, he noted a diffuse swelling on the left wrist ulnar border with limited range of motion (ROM) due to pain. At the local hospital, wrist radiographs were reported negative. He was diagnosed with a sprain wrist by the emergency room physician, immobilized with a wrist brace and referred to an orthopaedic surgery clinic for evaluation.

After one week of immobilization, the patient was evaluated by a general orthopaedic surgeon who recommended conservative treatment for a sprain wrist after confirming no fractures on initial radiographs. Following four additional weeks of immobilization with a splint, he persisted with intermittent pain. In view of these findings, the general orthopaedic surgeon referred the patient to a physical medicine and rehabilitation (PMR) specialist who recommended physical therapy (PT). Throughout PT sessions, he continued with mild discomfort at the ulnar side of the left wrist. Due to his persistent complaints, additional radiographs (Fig. 1) and a magnetic resonance imaging (MRI) were ordered by the PMR physician. The x-rays were negative for any bone injury. However, the MRI (Fig. 2) showed bone edema and a disruptive line on the hamate, compatible with a HoH fracture. For this reason, the physiatrist refers the patient to our orthopaedic hand clinic three months after the initial injury.

At the hand clinic, the patient reported a weak grasp after grabbing the bat at a baseball practice followed by an intermittent pain. He denied any numbness or tingling in his left hand. Physical examination showed local tenderness at the ulnar aspect, and a decreased muscle grip strength (3/5), compared to the contralateral hand. Preserved ROM without erythema, atrophy, or lack of sensory areas was noted in the left hand and wrist. Hook of hamate pull test (HHPT) was positive, showing moderate pain upon palpation between the ulna-carpal joint and fifth metacarpal bone. Tinel's sign and Phalen's test were negative for carpal tunnel syndrome. Allen test was negative for ulnar artery thrombosis. No intrinsic ligament injury or Triangular Fibrocartilage Complex (TFCC) tear were noted on the MRI. Based on the trauma history, persistent symptoms over 3 months and the radiologic findings a HoH fracture nonunion was diagnosed. Surgery was scheduled for an excision of the bone fragment.

At surgery, the Guyon's space approach initiated with a wrist volar incision parallel with the ulnar border of the ring finger to access the Guyon's canal. This method provides an entry to the fracture site by visualization of the motor branch of the ulnar nerve that helps to anatomically localize the HoH in relation to the nerve and establish adequate protection to avoid neurovascular damage. Then, the transverse carpal ligament was released from the hook, and the fragment was dissected and excised subperiosteally. After irrigation and wound closure, the patient was discharged home without complications on a volar splint for four weeks.

At the six-week follow up, a complete resolution of pain along with an intact grip muscle strength (5/5) and normal sensation were noted. He was then cleared to gradually return to baseball activities. On the two-year follow up visit, patient did not report any complaints and was actively practicing in a baseball academy.

Discussion

Hook of hamate fractures compromise two to 4% of all carpal fractures. In SI patients, these fractures are even more rare due to its largely cartilaginous nature making them relatively immune to injury [7]. Nonetheless, the significant presence of cartilage around the nucleus of the bone could mask a fracture [8]. Reports of HoH injuries in SI patients are currently limited. As consequence, there is no consensus for their treatment. Hence, our intention to report the youngest case in literature of a HoH fracture nonunion in a SI baseball player who was successfully treated with bone fragment excision.

The diagnosis of HoH fractures can be delayed or missed due to non-specific symptoms and false-negative radiographs at initial evaluation [10]. The belated diagnosis can lead to chronic pain, flexor tendons damage of the fourth and fifth fingers as well as sensory or motor deficits of the ulnar nerve [2]. Complaints of pain in the palm that are exacerbated by grasping, dorsoplantar motion, and fingers flexion; can give clinical clues for this fracture [3]. At physical examination, patients may present decreased grip strength, mild symptoms of carpal tunnel syndrome, and continuous pain that is exacerbated by movement and tight gripping [2,3]. When there is high suspicion, HHPT can provide an easy and specific test to clinically diagnose this fracture [9].



Fig. 1. Preoperative Plain Radiographs [Anteroposterior (A), Lateral (B) and Oblique (C) view].

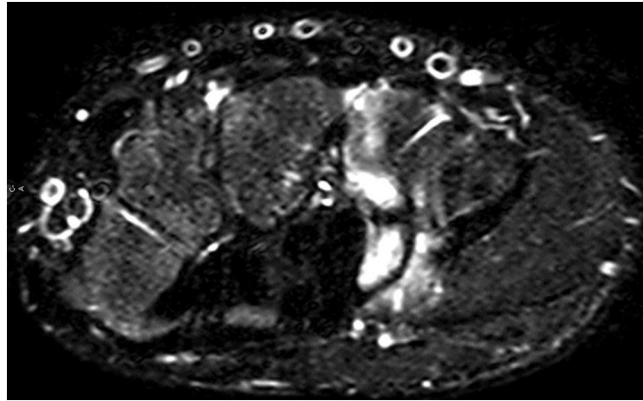


Fig. 2. Preoperative MRI view of left wrist demonstrates the nonunion of the hook of hamate fracture with associated bone edema.

Computed tomography is frequently used to diagnose hamate fractures in SM patients [3]. However, the use of MRI is recommended to assess for neurovascular injuries, TFCC tear, nonunion, non-fused ossification center, or other carpal fracture [1,3,9], in addition to avoid radiation exposure in the SI. Radiologic findings such as absence of well corticated margins and bone edema in MRI support the diagnosis of a HoH fracture over other conditions in the differential such as an accessory ossicle or Os hamuli proprium, especially if trauma history and ulnar symptoms are present.

Among SM individuals, conservative treatment for HoH fractures has led to a high nonunion rate due to the limited blood flow to the hamate, motion at fracture site, displacement of fracture's fragment or the tension that is exerted by the piso-hamate ligament [3,10]. When there is a nonunion, studies have evidenced that bone fragment excision is the fastest and most effective treatment for SM athletes who wish to return to sports [6]. Based on these observations and the lack of surgical indications for SI patients, we provided the SM surgical alternative to our young patient. After 12 weeks without fracture healing and the family desire for the patient's prompt return to sports activities, we opt for HoH fracture fragment excision instead of an open reduction and internal fixation of the nonunion. We rely on literature about SM athletes to address this SI individual.

This case represents the youngest patient in literature with a HoH fracture nonunion and exemplifies the successful use of surgical fragment excision in a SI baseball player with no functional impairment and prompt return to the field. After two years of postoperative follow up, our surgery proved to be an effective treatment alternative providing successful results as seen in SM population.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of consent is available for review by editor-in-chief of this the journal on request.

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