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Case Report

Hook of Hamate Regrowth After Surgical Excision: A Report of Two Cases

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Two high-level baseball players sustained a hook of hamate fracture while batting and were treated with excision of the fragment. Both players returned to play, and both had repeat fractures through a regenerated hook. This phenomenon of hook of hamate regeneration has not been well described in the literature. In conclusion, hook of hamate regeneration can occur after fracture fragment excision. The incidence and risk of this sequela as well as its association with surgical technique is uncertain.

Hook of hamate fractures are relatively rare injuries with a reported incidence of 2% to 4% of all carpal fractures.[1] However, the true incidence is unknown as these injuries are difficult to diagnose and often are misdiagnosed on the initial evaluation.[2,3] Hook of hamate fractures are most commonly seen in young athletes playing baseball, hockey, golf, or tennis and occur while performing a swinging-related activity.[3,4] The etiology of the majority of these injuries is because of direct trauma to the hook of hamate from the bat, racket, or club in some cases, whereas others are secondary to an abnormal stress response in the hook of hamate from repetitive load.[5] Although various preventative measures have been proposed to decrease the risk of hook of hamate fracture, none have been widely adopted as this injury is considered a one-time event to the bottom hand during batting.[6]

Treatment options for hook of hamate fractures include both surgical and nonsurgical management. The two main factors to consider when evaluating treatment options are time since the original injury and patient activity level. The risk of nonunion is high with nonsurgical treatment. However, the true incidence of nonunion is somewhat unclear as the literature is divided with some studies demonstrating high union rates with early diagnosis and immobilization while other studies report nonsurgical treatment failure rates nearing 100%.[2,7,8]

Given the unpredictable results of nonsurgical care, patients and physicians commonly elect for surgical management. Because of the hook of hamate fractures occurring predominantly in athletes who are eager to return to sport, surgical excision of the fracture fragment is the most common treatment. Open reduction internal fixation is an option with a reported advantage of maintenance of grip strength[8,9]; however, the fragment must be large enough to be amenable to fixation, and patients are faced with long recovery times.[3,10] In contrast, fragment excision has relatively short recovery times and generally favorable outcomes.[2,4,8,10] This case report details two patients who underwent hook of hamate excision after fracture, returned to baseball uneventfully, and sustained a refracture through a regenerated hook of hamate.

Case Reports

Case 1

The patient was an otherwise healthy, 17-year-old, left-hand-dominant baseball player who presented with 3 weeks of right wrist pain. The pain started while batting left-handed and was primarily located at the ulnar base of the right palm. Radiographs demonstrated a nondisplaced hook of hamate fracture (Fig. 1A–C). The next day, he underwent an uncomplicated, hook of hamate excision with a subperiosteal excision. At his 1-week post-op visit,

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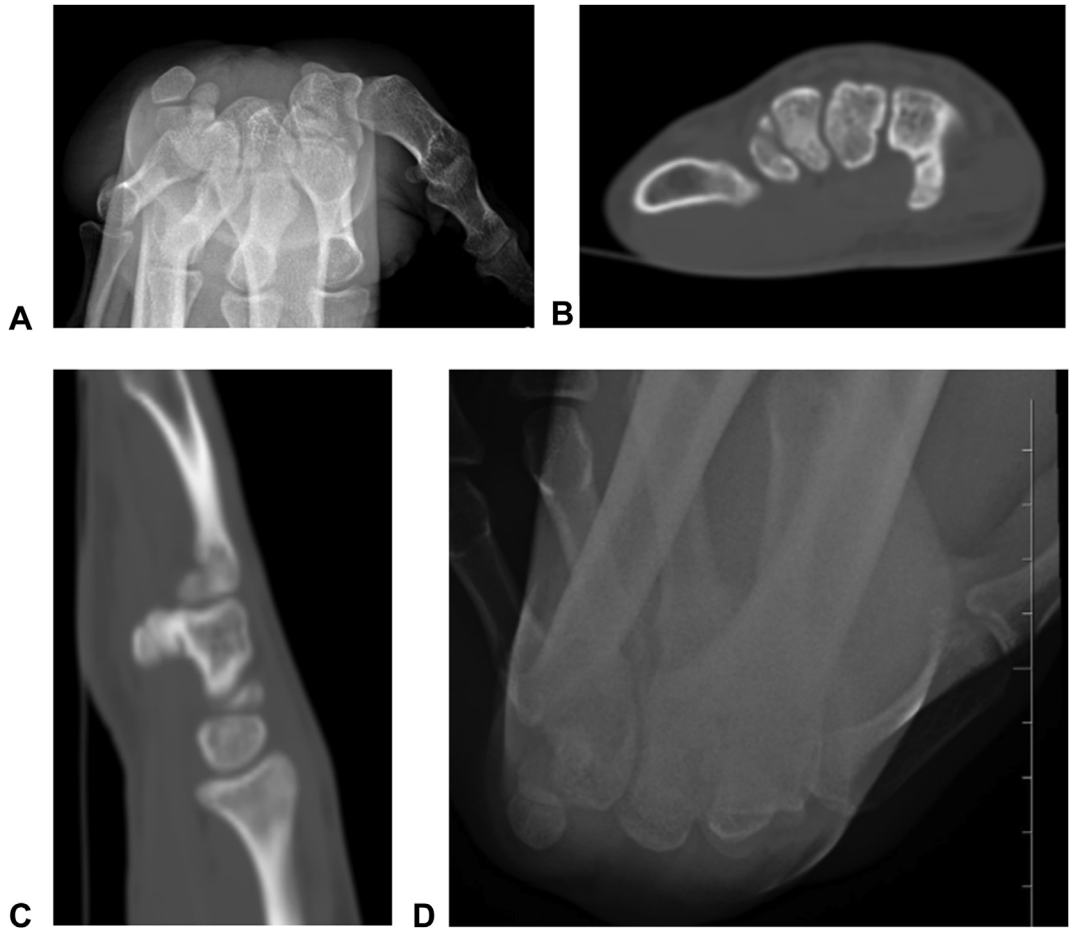

Figure 1. Collection of images of the initial hook of hamate fracture from case 1. **A** a carpal tunnel view radiograph, **B** axial computed tomography scan slice, and **C** sagittal computed tomography scan slice—all demonstrating a fractured hook of hamate. Part **D** is a carpal tunnel view after surgery confirming hook of hamate excision.

the patient was doing very well and denied pain, numbness, or other complaints. He was provided a wrist splint to be worn for 2 weeks and then slowly weaned while increasing activities under the guidance of his athletic training staff. Radiographs obtained 2 months after surgery demonstrated absence of the hook of hamate fragment (Fig. 1D).

Three years and 4 months later, the patient presented to the clinic with complaints similar to those at his initial presentation. Prior to this second presentation, he had completely recovered from his index procedure and returned to his previous level of play as a professional baseball player. On representation, he complained of acute right wrist pain that began after striking a baseball while batting left-handed. On physical examination, he was acutely tender over the hamate dorsally and palmarly. He was limited to only 75° of small finger metacarpal–phalangeal joint flexion. Radiographs and a computed tomography scan demonstrated a displaced fracture through the base of a well-formed, regenerative hook of hamate (Fig. 2). The following day, the patient underwent excision of the regenerated hook of hamate fragment. The second surgery and recovery were uneventful.

Case 2

The patient was a 28-year-old, right-hand-dominant professional baseball player who presented with acute pain in the ulnar base of his left hand beginning during batting. The patient had a surgical history of excision of a fractured hook of hamate in 2014 (8 years prior) while a collegiate baseball player. His original surgical excision and management were performed at an outside hospital without available details on the excision technique. At representation, the patient had mild swelling and point tenderness over the hook of hamate. Computed tomography demonstrated a nondisplaced fracture through the base of a well-formed, regenerative hook of hamate (Fig. 3). The patient was treated with an uncomplicated excision of the fractured, regenerated hook of hamate fragment. He did well after surgery and returned to sport as expected.

Discussion

We are aware of only one reported case of a fracture through a previously excised hook of hamate.[11] Similar to the patients presented in the current report, the previously reported patient was a professional baseball player who sustained a fracture of a regenerated hook of hamate 4 years after his initial hook of hamate excision.

In a large retrospective review published in 2017, Bansal et al[4] evaluated 81 cases of subperiosteal excision of the hook of hamate. This study demonstrated high success rates and reported a return to play time of 6 weeks.[4] Despite generally favorable results, there was a complication rate of 25% including transient ulnar nerve sensory and/or motor disturbance, pain over surgical scar, superficial infection, wound dehiscence, and abnormal sensation in a nonulnar nerve innervated distribution.[4] Ninety-six percent of

Figure 2. Select computed tomography scan images of case 1 four years after the hook of hamate was excised when patient represented with new, acute wrist pain. An axial computed tomography **A** slice and **B** sagittal. Both depict a fracture through the regenerated hook of hamate.

Figure 3. Computed tomography images of case 2 obtained on representation with acute wrist pain, 8 years after fractured hook of hamate excision. These **A** axial and **B** sagittal slices demonstrate a fracture through the regenerated hook of hamate.

patients in this study returned to their preinjury level of play at an average of 6 weeks without reported findings of regeneration of the hook of hamate.

The findings of Bansal et al[4] were supported by two subsequent retrospective reviews investigating hook of hamate fracture excision specifically in professional baseball players.[12,13] Sheridan et al[13] analyzed 145 hook of hamate fractures treated by a single surgeon using subperiosteal fragment excision. In this large cohort, several minor complications were observed including two patients (1.4%) experiencing transient numbness in the ring finger and small finger, six patients (4.1%) with pisotriquetral pain when returning to batting practice, and one patient (0.7%) developing heterotopic ossification. All these minor complications self-resolved after a strength and conditioning treatment program and did not require other intervention.[13] Erickson et al[12] described outcomes and return to sport performance of 261 professional baseball players who underwent fractured hook of hamate excision. They reported that 81% of players returned to the same or higher level of play with a mean return to sport of 48 days. The hook of hamate excision technique (subperiosteal or extraperiosteal) was not reported; regeneration was not observed or mentioned in either of these large, retrospective reviews.

Subperiosteal excision of hook of hamate fractures is the most commonly reported surgical technique.[13,14] This approach uses an incision over Guyon canal with careful dissection and mobilization of subcutaneous tissue. The palmaris brevis muscle is identified, divided, and elevated at its radial edge off Guyon canal. The ulnar artery and superficial sensory branch of the ulnar nerve are then identified and protected as they pass through Guyon canal and rest atop the hook of hamate. These structures, as well as the deep motor branch of the ulnar nerve, are mobilized and gently retracted. The hook of hamate is exposed in a subperiosteal fashion down to the fracture site. A rongeur or osteotome is used to remove the fractured fragment, and the remaining hamate bone is smoothed using a rasp or rongeur.[14]

The subperiosteal technique is commonly reported and is considered to be safer in protecting the superficial sensory and deep motor branches of the ulnar nerve.[2,3] However, extraperiosteal fragment excision has also been described.[15] Proponents of the extraperiosteal approach argue it is preferred because of less disturbance to perihamate ligaments.[15] Additionally, a retrospective review by Smith III et al[16] supports extraperiosteal excision and claims that subperiosteal hook of hamate excision can be associated with recurrent bone formation, which may be painful. The cited source of this claim was via personal communication of Smith III et al with Dr William Burkhalter in 1987. However, since this publication, bone regeneration has not been cited as a sequela or complication of subperiosteal hamate fragment excision.

Secondary to the episodic nature of the care of patients with hook of hamate fractures and the relatively uncomplicated and short recovery periods, there is rarely a long-term follow-up. Postoperative radiographs are not standard, as the fractured

fragment is removed in its entirety in the operating room, and thus, there is no additional healing to monitor with repeated imaging. The true incidence of regrowth of the hook of hamate is unknown, and given the rarity of hook of hamate fractures related to very specific predisposing activities, regrowth is likely relevant to only a small percentage of athletes who continue with their sports for years after a primary hook of hamate excision.

Despite the lack of published evidence, the authors believe that an extraperiosteal excision technique is a reasonable exposure option that may decrease the risk of regrowth of the hook of hamate. Surgeons should be aware of the risk of hook of hamate regrowth, which, although seemingly quite rare, is most relevant for athletes continuing in their sport for years after the initial injury.

Informed Consent

Verbal informed consent was obtained from both parties for publication of this case report and accompanying images. (Washington University Institutional Review Board Clearance ID# 202404046).

Conflicts of Interest

No benefits in any form have been received or will be received related directly to this article.

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