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Operative Techniques in

Sports Medicine

Hamate Hook and Pisiform Fractures

Andre D. Ivy, MD, MS, and Peter J. Stern, MD

Though rare, hook of hamate (hamulus) fractures and pisiform fractures are serious injuries in the athlete that should not be missed or underestimated. Failure to promptly diagnose and treat these fractures may lead to serious complications including avascular necrosis, nonunion, tendon rupture, carpal instability, neurovascular compression, and arthritis. Hamulus fractures should be suspected in the athlete with persistent hypothenar hand, particularly those who use a bat, racket, or club. Complete hamulus excision after fracture has been shown to provide consistent pain relief and return to sport. Pisiform fractures are uncommon. Excision may provide benefit in the setting of a displaced fracture. Return to sport after any carpal fracture should focus primarily on the future health of the athlete, with future play only as a secondary aim.

Oper Tech Sports Med 24:94-99

KEYWORDS athlete, hook of hamate, pisiform

Introduction

Up to 25% of all athletic injuries occur in the wrist.[1] Scaphoid fractures account for nearly 70% of carpal fractures with 30% involving the 7 remaining bones.[2] Because of the variable and often occult presentation of these injuries, the diagnosis can be challenging.[2] The subtlety of clinical findings and complex anatomy of the carpal bones leads to missed and likely underreported injuries.[2,3] A knowledge of the clinical and radiographic presentation of these fractures is of importance to surgeons treating athletes. Failure to promptly diagnose and treat these fractures may lead to devastating sequelae including avascular necrosis, nonunion, tendon rupture, carpal instability, neurovascular compression, and arthritis.[2,4-6]

Fractures of the carpal bones must be approached with the whole athletic picture in mind. An understanding of sport-specific details such as position played, hand dominance, time in season, competitive level, and future sport expectations are essential in directing treatment. An injured athlete may risk loss of playing time, loss of preinjury performance, and even loss of a prospective sports career.[7] The significance of these fractures may be minimized by the coaching staff, treating physicians, or the athletes themselves.[8] The primary aim of the physician is the well-being and future health of the athlete, with future play only as a secondary goal. Optimal fracture treatment includes early diagnosis, a stable anatomical reduction, sufficient immobilization, and thoughtful and timely rehabilitation.

Deciding when an athlete can return to sport poses a challenge to the treating surgeon. Protective devices are crucial to implementing rehabilitation. If unfamiliar with the sport played, the treating physician, in collaboration with an athletic trainer, can ask the athlete to bring in the sports equipment to aid in splint creation. The risk of prematurely competing after injury should be weighed against the consequence of delayed return incurred by the athlete. There is limited literature to guide return to play in these injuries.

Hamate Hook Fractures

Anatomy

The hamate articulates with the fourth and fifth metacarpals distally, lunate proximally, capitate radially, and the triquetrum ulnarly via an oblique facet. It is recognizable by its hook-like process protruding palmarly into the hypothenar region. The hook of hamate or hamulus ossis hamati is slightly curved from ulnar to radial.[4] It is palpable in the hypothenar hand 2 cm distal on a line drawn from the pisiform to the index metacarpal head (Fig. 1). Palpation may be difficult secondary

Department of Orthopedic Surgery, Univeristy of Cincinnati College of Medicine, Cincinnati, OH.

The authors declare no conflicts of interest.

Address reprint requests to Andre D. Ivy, MD, MS, Department of Orthopedic Surgery, Univeristy of Cincinnati College of Medicine, Medical Sciences Building Room 3109, 231 Albert Sabin Way, PO Box 670531, Cincinnati, OH 45267-0212. E-mail: andre.ivy@gmail.com

 http://dx.doi.org/10.1053/j.otsm.2016.01.002
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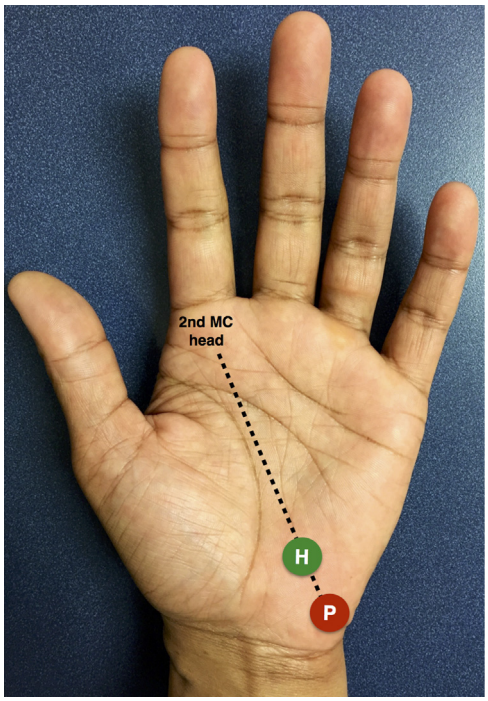

Figure 1 Pisiform and hamate surface landmarks. (Color version of figure is available online.)

to the relatively thick hypothenar skin, fibrous tissue, and the palmaris brevis muscle. A total of 3 hamulus subtypes have been described as follows: bipartite, hypoplastic, and hook aplasia.[9] The hamulus marks the distal ulnar border of the carpal tunnel and the distal radial border of Guyon canal. The deep motor branch of the ulnar nerve is intimately associated with the base of the hook. It passes to the ulnar side of the base and then heads deep and radial to innervate the hypothenar muscles, intrinsic muscles, adductor pollicis, and deep head of flexor pollicis brevis. Its base serves as a fulcrum for the ulnar digit flexors,[10] increasing flexion force especially in wrist ulnar deviation.[11] The attachments to the hamulus include the transverse carpal ligament radially, the pisohamate ligament ulnarly, and the flexor digiti minimi and opponens digiti minimi muscles. These multiple attachments confer stability, but may also contribute to fracture displacement and increased nonunion rates.[2,8]

Perfusion of the hook of the hamate is provided through a large foramen at the base and smaller foramina at the tip. The latter may be absent in 30% of cases, likely playing a role in fracture nonunion and avascular necrosis of the hook in the setting of base fractures.[5]

Pathogenesis

Hamulus (hook) fractures are uncommon and account for 2% of carpal fractures.[4] They often occur secondary to trauma to the hypothenar eminence while using a bat, club, or stick.[4] The palm acts as a fulcrum, directing compressive, shear, or combined forces into the prominent hamulus. Fractures are classified based on the location of the fracture line into base fractures, middle third, and distal third fractures.[12] Fractures most frequently occur at the base.[4] The increasing popularity of golf, baseball, and other racquet sports has led to a higher incidence of these injuries.[2] In 2-handed sports, the non-dominant hand is often injured. In 1-handed racket sports, the dominant hand is most often involved.[13] Baseball is the most common source of these fractures in athletes, often occurring during the "check-swing" while batting.[12,14] Hockey players are particularly susceptible from repetitive "slap shots."[14] The hand and wrist are the most frequently injured sites in golfers, with hamulus fractures as the most common bony injury,[15,16] often seen in the lead hand secondary to poor swing mechanics or after a sudden traumatic event such as ground strike during a swing.[15,16] In sports requiring prolonged power grip, such as climbing, forceful finger flexion leads to ulnar displacement of the extrinsic flexor tendons and shear stresses across the adjacent hamulus base.[4] Partial, stress fracture nonunions have been described on the radial or tension side with bony union of the ulnar compressive side.[17]

History and Physical Examination

Hamulus fractures should be suspected in athletes with prolonged, vague pain in the hypothenar hand, particularly in those practicing club sports. Hypothenar skin callus or bruising may be seen from repetitive trauma. Pain may be elicited with direct compression of the hamulus. Although range of motion of the wrist is often full,[8] a tight grip may cause pain and grip strength may be decreased.[13] The "Pull test" may elicit pain on resisted flexion of the ulnar 2 digits with the wrist held in ulnar deviation[18] (Fig. 2). Ulnar neuropathy at the wrist is a common finding.[2,4] Ulnar artery thrombosis and entrapment of the flexor tendons to the ulnar 2 digits have been described.[19] These symptoms may prohibit continued sport participation.[20]

Diagnostic Studies and Imaging

Standard radiographs are often inconclusive and only identify 31% of fractures.[21] In total, 3 radiographic findings are suggestive of fracture: absence of the hook, sclerosis of the hook, and lack of a cortical density.[2,22] The "ring sign" of a displaced and flexed hook may be seen on posteroanterior

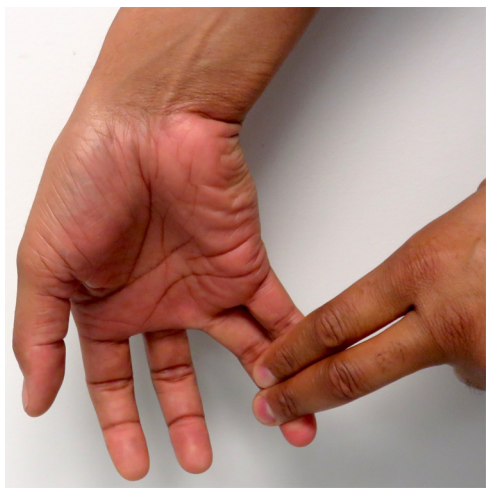

Figure 2 Hook of Hamate Pull Test. (Color version of figure is available online.)