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Case Report

Pisiform Fracture Dislocation after a Crush Injury: A Case Report

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Abstract

Introduction: Fractures of the carpal bones, aside from the scaphoid, are relatively uncommon injuries. Fracture-dislocation injuries of the pisiform represent few reports in the current literature, with even fewer reports due to direct crush injuries of the wrist/hand.

Case Summary: We report the case of a 44-year-old male who presented to our institution after a piece of machinery fell onto his right upper extremity, crushing his right wrist. Plain radiographs of the right wrist and CT imaging of the right upper extremity demonstrated a comminuted fracture of the hamate, avulsion fracture of the triquetrum, and fracture-dislocation of the pisiform. The patient was initially treated conservatively with a removable cockup wrist splint and occupational therapy. The patient continued to experience limitations in wrist range of motion and pain, therefore surgical intervention was offered in the form of right wrist arthroscopy and pisiform excision. Intraoperatively, a diagnostic wrist arthroscopy demonstrated a complex, split TFCC tear that was repaired with no additional pathology noted to the ligamentous or articular surfaces. Then utilizing a volar incision, distal and proximal pisiform bone fragments were identified excised. Postoperatively, the patient was transitioned out of a splint and wrist range of motion exercises were initiated. The patient reported significant reduction of wrist pain and was released back to full duty at work.

Conclusion: Pisiform excision can be performed with excellent outcomes in patients with persistent pain following non-operative treatment of pisiform fractures.

Keywords: Case report; Crush injury; Dislocation; Excision; Fracture; Pisiform

Introduction

Fractures of the carpal bones, aside from the scaphoid, are relatively uncommon. Specifically, the triquetrum represents 15% of all carpal fractures whereas the hamate and pisiform each comprise 2% of all carpal fractures [1]. The most common mechanism for carpal injury is a fall onto an outstretched, extended hand [1-3]. Given that pisiform fractures are relatively uncommon, fracture-dislocation injuries of the pisiform represent few reports in the current literature, with even fewer reports due to direct crush injuries of the wrist/hand [4-8]. We report a crush injury resulting in pisiform fracture- dislocation, as well as triquetral and hamate fractures.

Case Report

We present the case of a 44-year-old male who presented to our institution after a piece of machinery fell onto his right upper extremity, crushing his right wrist. He was brought to a local emergency department where plain radiographs of the right wrist and CT imaging of the right upper extremity were obtained demonstrating a comminuted fracture of the hamate, avulsion fracture of the triquetrum, and fracture-dislocation of the pisiform (Figures 1-5). The patient was placed in a volar resting splint, instructed to remain non-weight bearing to the right upper extremity, and was to follow up within 1 week of injury. He presented to our institution four days following injury for evaluation and at that time noted significant pain diffusely in his right wrist. He also reported numbness and tingling throughout the digits of his hand. Physical examination of the right upper extremity revealed ecchymosis of the hand and volar forearm and tenderness at the ulnar aspect of the wrist. Wrist range of motion was limited secondary to pain, however he had full range of motion of the digits. Patient was instructed to continue use of the splint and remain non-weight bearing.

Figure 1

Figure 2

Figure 3

Figures 1-3: Presenting radiographs of the right wrist in the AP, lateral and oblique views.

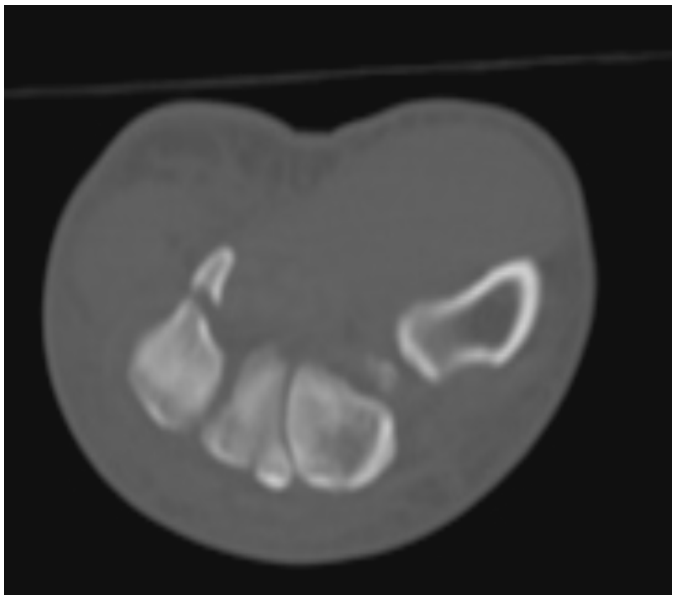

Figure 4

Figure 5

Figures 4 and 5: CT images in the axial and sagittal plans demonstrate hook of the hamate fracture and a fracture dislocation of the pisiform, respectively.

The patient presented for follow up one week later with reports of continued but improving pain, which he now localizes to the ulnar aspect of the wrist. Numbness and tingling of the hand have improved, but are intermittently present to the small and ring fingers. Physical exam demonstrated continued tenderness of the ulnar wrist/hand localized over the pisotriquetral joint, the volar aspect of the triquetrum, hook of the hamate, and pisiform. Wrist flexion was measured at 30 degrees and extension 60 degrees, respectively. The patient also had decreased sensation to the right small and ring fingers, and a positive Tinel's sign at the level of the elbow. The remainder of the exam was negative and no new imaging was obtained. At this point, pisiform and/or hook of hamate excision was discussed with the patient if his symptoms did not continue to improve. Furthermore, numbness and tingling in of the ulnar nerve distribution was expected to improve as swelling went down. Therefore, the patient elected to continue conservative management and was transitioned into a removable cockup wrist splint, provided one handed work restrictions, and instructed to return for reevaluation in 4 weeks.

Six weeks after injury, the patient presented to clinic and was still experiencing mild ulnar sided wrist pain and was reporting frustration due to the limited use of his right hand. He reported continued use of the cock up brace and had maintained his work restrictions. He expressed interest in return back to work with use of his right hand. Physical exam at that time demonstrated the tenderness over the hook of the hamate had resolved, however mild tenderness of the pisotriquetral joint and the volar pisiform persisted. Range of motion of the wrist and decreased sensation of the ulnar nerve distribution, primarily on the ulnar aspect of the fifth digit, had not improved significantly. Radiographs of the right wrist were obtained in the AP and lateral views demonstrating the unchanged proximal migration of the pisiform with no other abnormalities (Figures 6 and 7). Given that tenderness over the hook of the hamate has completely resolved and only mild tenderness of the pisiform and pisotriquetral joint remained, the patient was instructed to wean out of the splint and was allowed to advance his activity with a 10 pound lifting restriction. We elected to continue to monitor the numbness and tingling of the small and ring fingers as they were improving and felt to be related to the initial injury. He was also provided a prescription for occupational therapy to begin gentle wrist stretching and range of motion exercises.

Figure 6

Figure 7

Figures 6 and 7: Radiographs of the right wrist in the AP and lateral views obtained 6 weeks after initial injury.

The patient completed 4 weeks of occupational therapy with no significant improvement in wrist range of motion or pain. Nine and a half weeks after initial injury, the patient's physical exam demonstrated persistent tenderness at the pisotriquetral joint, the volar aspect of the triquetrum, and pisiform as well as decreased sensation to the ulnar aspect of the small finger. Given the patient's persistent ulnar sided wrist pain and lack of improvement with conservative measures, arthroscopic evaluation of the right wrist and pisiform excision was offered. After explaining the risks, benefits, and alternatives, the patient elected to proceed with surgical intervention. The patient was brought back to the operating room and regional anesthesia was achieved with an axillary nerve block. The patient was placed in the supine position, the upper extremity was sterilely prepped and draped and a surgical time out completed. The procedure began with a diagnostic right wrist arthroscopy where the standard 3, 4 and 4, 5 portals were created. Arthroscopic examination of the wrist joint revealed mild fraying of the scapholunate ligament without signs of articular cartilage damage at the scaphoid fossa or scapholunate joint. Mild chondromalacia was noted to the ulnar aspect of the wrist and a peripheral tear of the Triangular Fibrocartilage Complex (TFCC). There was an unusual split tear also found at the TFCC near the location of the peripheral tear. The edges of the TFCC tear were gently debrided and the sagittal split was repaired with 2 sutures securing the TFCC down to the capsule. Remainder of the arthroscopy demonstrated mild chondromalacia of the midcarpal joints. Probing of the lunotriquetral joints demonstrated no instability, however grade I instability as noted at the scapholunate joint. No other abnormalities were noted.

At this point, we were satisfied with the diagnostic wrist arthroscopy portion of the procedure and moved our attention to excision of the pisiform. A volar diagonal incision across the wrist crease was made to expose the pisiform. The pisiform was found to be displaced 5mm proximal to the articular facet of

the triquetrum and using a bovie and ronguer, the pisiform was excised from the FCU tendon. A small bone fragment was found distally and subsequently excised, which likely represented the distal pole of the pisiform. Skin incisions were closed and the wrist was placed in a well-padded ulnar gutter splint. Three weeks later, at the first postoperative visit, the patient reported significant reduction of wrist pain, with unchanged numbness along the ulnar aspect of the small finger. Incisions appeared to be well healed and was transitioned to a removable cock up wrist brace. The patient was instructed to begin gentle range of motion of the wrist in 3 weeks. He was to maintain work restrictions of no use of the right hand. At the 7-week postoperative visit, the patient was found to have slightly limited active and passive range of motion of the wrist, lacking terminal flexion and extension. The decreased in range of motion was not functionally limiting nor was it felt the patient would benefit from additional occupational therapy. He had minimal ulnar sided wrist pain and reported complete resolution of numbness of the small finger. At that point, he was released back to full duty at work and instructed to continue wrist range of motion exercises.

Discussion

The pisiform is a pea shaped bone located in the proximal row of carpal bones and has a smooth surface that articulates dorsally with the triquetrum [6,7,9]. The triquetrum is pyramid shaped and articulates distally with the hamate [10]. Pisiform fractures can be classified as parasagittal, transverse, comminuted, pisiform-triquetral impaction fractures, and avulsion fractures [1]. Pisiform dislocations commonly occur due to increased tension on the attached ligaments and most reported cases describe distal pisiform dislocation [4,5,8]. In our case, the dislocation occurred as a result of direct trauma from the crush injury and dislocated proximally as opposed to the more common distal dislocation. However, intraoperatively there was a small bone fragment noted distally, which likely represented a small distal avulsion fracture of the pisiform. A literature review conducted by Petrou, et al. identified one fracture dislocation of the pisiform of 19 cases involving pisiform dislocation, therefore our case represented a fairly unusual injury pattern [7].

The unique presentation of this case and its relatively uncommon occurrence contributed to the difficulty in determining the best course of treatment. Conservative treatment has been described for the triquetrum, hamate, and pisiform fractures, with the consensus being immobilization for an average of 3-6 weeks, followed by progressive wrist range of motion and strengthening exercises [1-10]. Nonsurgical treatment has been shown successful in many cases [1-10], but operative treatment is recommended if pain or instability persist [1,3-9]. Open reduction with internal fixation may be a consideration but has shown poor results and is not currently recommended [4,7,8]. Pisiform excision is the preferred method of surgical intervention and can relieve significant pain and restore function [1,4-9]. In this case, the failure of conservative treatment and subsequent persistent pain led to a pisiform excision with excellent results in patient wrist functionality and pain. Crush injuries to the carpus resulting in pisiform fracture dislocations are not commonly seen. There are very few reports of crush injuries involving pisiform fracture or dislocation. Of 19 cases identified in a literature review conducted by Petrou et al. only two pisiform dislocations involved a crushing mechanism [7]. Crush type injuries have the potential to cause multiple associated injuries, and therefore pose a significant challenge in determining the best course of treatment. It is important to correctly identify these injuries as they can be difficult to diagnose and treat. In the presence of persistent pain, as in our case, pisiform excision can be performed with good outcomes.

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