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Case Report

Total carpometacarpal fracture dislocations: An extremely rare crushed hand

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Abstract

Crushing hand injuries are still a challenging field. Carpometacarpal (CMC) joints fracture-dislocations are reasonably infrequent conditions. Typically, mechanism of injury is high energy trauma. Crush hand injuries are not uncommon in developing countries where the safety rules and guidelines appropriate to the specific job don't practice well or safety equipment such as restraints, pullbacks, and two-hand devices aren't easily accessible at the workplace. We present a 36-year-old worker with crush hand and total carpometacarpal dislocations. He was managed early in a multidisciplinary setting and after about one-year follow-up had an acceptable outcome. One key point in the management of such complex injuries is early and precise bony stabilization.

Keywords: Hand, injury, carpometacarpal, dislocation, crush, dislocation, fracture

INTRODUCTION

Crushing hand injuries are still a challenging field. A massive compressive force starts the process by squashing the hand and making fissures throughout the web space following by interosseous muscles disruption in deeper areas. Soft tissue including the interosseous muscles extrudes through the fissure lines and create the characteristic feature of “crushed hand”. When force is continued, other parts of the skin and soft tissue would be affected in addition to fracture and dislocations. If the precise handling of these hands is done at a trauma center, shorter hospitalization and faster recovery along with the better outcome is expectable [1-4].

Fractures and dislocations of the Carpometacarpal (CMC) joints are quite uncommon, although thumb is an exception [1]. Typically these injuries are related to high energy trauma. Strong ligaments, tendons and muscles and specific bony geometry stabilize these joints. These injuries account in such studies for about less than 0.1% of injuries affecting the hand [2-5].

Yoshida et al. reported on the mechanism of CMC dislocations. The vast majority (91%) of cases included in the report were subjected to heavy objects forces on a fist ed hand or traffic accidents. Missed diagnosis is not uncommon, severe hand swelling obscuring deformity in physical exam and X-rays with minimal findings (for example ring and small CMC joints are easily obscured by the overlap of the hamate on the metacarpal bases in anteroposterior and lateral radiographs) [6].

CASE PRESENTATION

In 2015, left (non-dominant) hand of a 36-year-old male worker was injured, when accidentally his hand was struck on the palm with a severe blow from a heavy roller. He was admitted at emergency department 30 min after trauma. Initially, he had a painful crush open palmar wound, the capillary filling was not good. The patient received emergent surgery under general anesthesia (Department of Orthopedic Surgery, Imam-Reza hospital). X-rays showed CMC dislocations at four radial side digits and severe communication at the base of the index and third metacarpal bones (Fig. 1). Exploration revealed median nerve laceration in the palmar region but without discontinuity and injury to the palmar arterial arch so vascular surgery consultation was done but revascularization was not needed.

Precise debridement of contaminated small bone fragments and devitalized soft tissue was done and then CMC joints were reduced by intramedullary k-wires. The fifth CMC also was sub-luxated but easily reduced, rigid fixation wasn't obtained at the base of 2nd metacarpal because of the bone defect. The first metacarpal was floating due to metacarpo-phalngeal dislocation. The reduction was confirmed with an image intensifier and the wound was irrigated again and closed and a dorsal plaster splint was applied. There was a concern about evolving compartment syndrome after surgery but the swelling got better the



Fig. 1. Initial X-rays

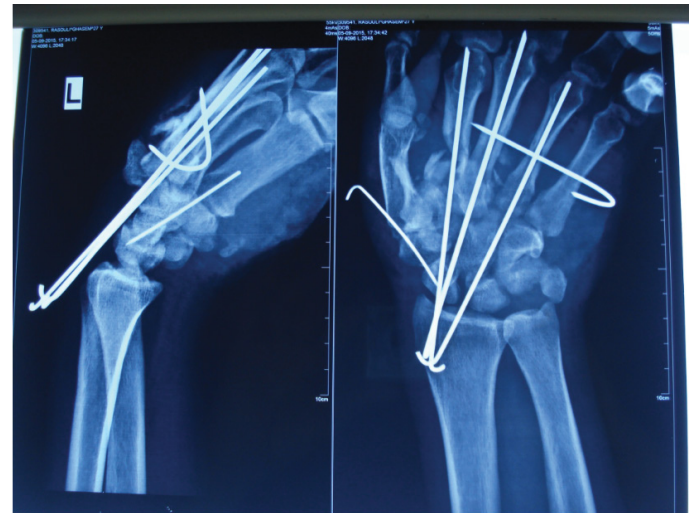


Fig. 2. Internal fixation



Fig. 3. Final follow-up X-ray

day after. Post-operation X-rays were acceptable (Fig. 2). Active motion of the fingers began at first postoperative day while the wrist was held in a short arm splint. Three days after surgery he was discharged with oral antibiotics and ten days later readmitted for wound discharge, so surgical debridement was considered. The patient was culture negative and discharged free after five days. The patient had poor compliance for rehabilitation and follow-up (Fig. 3). At final follow up (11 months after injury) he felt mild dull pain during extreme range of motion and had a near normal wrist and hand range of motion.

DISCUSSION

Crush hand injuries are common in developing countries where the safety rules and guidelines appropriate to the specific job are not practiced well or safety equipment such as restraints, pullbacks, and two-hand devices aren't easily accessible at the workplace.

A large number of occupational injuries are recorded in the emergency facilities annually. Work-related crushed hand injuries are seen in factories workers, construction workers, installation and repair service providers, and persons who are involved in transportation and shipments. The worse part of these injuries is that the majority of them are unpreventable. Another major cause of crushed hand is

traffic accidents. These type of injuries potentially can lead to severe permanent morbidity.

A severely injured crush hand with almost whole bony and soft tissue involvement is a tough situation for orthopedic and hand surgeons. There are many issues to navigate. In-round initial limited debridement in conjunction with suitable bony fixations are the keys [7]. CMC joint is an example of inherently stable joints, not only because of stout dorsal transverse ligament but also firm longitudinal ligament on the volar aspect. So, high energy trauma is needed to disrupt this robust structure [8].

While bony fixation results might be encouraging, initial intrinsic muscle loss and following necrosis or debridement, interfere with final particular functions and motions, this issue have to be taken in consideration with rehabilitation team and physiotherapists. The literature for this area of hand injuries has shown a lack of study with a high level of evidence. Most of the existing reports in the topic of multiple CMC dislocations [2,3,9,10], showed that open reduction is the better choice. Although at first evaluation some surgeons rely on limited percutaneous bony fixation in an efforts to avoid secondary iatrogenic injury to a rigorously crushed soft tissue, open reduction affords a chance to detect and restoration of all osteochondral pieces

and thoroughly debridement of small intra-articular particles. Kirschner wire intramedullary fixation of all fracture dislocation maintain the natural length of structures and keep the overall hand shape, throughout the complete soft tissue healing process. We couldn't find a high-level study including cases with total CMC dislocations but Bao et al. in a retrospective series of 86 patients have compared the functional outcome of plate fixation vs. wire fixation in patients with fourth and fifth CMC dislocations. This study showed a higher outcome with K-wire fixation [11]. More important, with a secure fixation it's possible to start immediately any aggressive rehabilitation program which is imperative for these young active workers/employees to return to work soon [3,9]. The best strategy for this complex hand injuries are prevention and some simple attention and awareness may lessen the incidence. Occupations health education should be improved especially in developing countries. Prompt evaluation of the extent of injury and debridement early as possible is the key to and can strongly affect the outcome.

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