Open metacarpophalangeal dislocations: literature review and case report

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Abstract

Background Open dorsal metacarpophalangeal joint dislocations are rare. We report the case of a 62-year-old man who fell from a height of 10 m onto his left outstretched hand and presented to us with four open dorsal metacarpophalangeal joint dislocations. We review the literature and present our case to elucidate the best treatment protocol for open dorsal metacarpophalangeal joint dislocations.

Methods A systematic review was conducted using MEDLINE, Embase, and PubMed from 1946 to present. Publications were found using key terms and cross-referencing. Detail on patient demographic, presentation, mechanism of injury, injury management, and outcome were collected.

Results A total of 102 articles of metacarpophalangeal joint dislocation (excluding thumb dislocations) were identified. Of these, only four were of open dorsal metacarpophalangeal joint dislocation involving the four long fingers. Open dislocation of the metacarpophalangeal joint in these studies showed no hand predominance, nor association with hand dominance.

Conclusion Open dorsal metacarpophalangeal joint dislocations of the four long fingers are unusual. Based on the available case reports and our experience, we suggest addressing this injury intraoperatively with minimal delay. Most cases will be associated with volar plate injury, and we encourage its

repair with figure-of-eight stitches. Postoperatively, we suggest a dorsal blocking splint for 2 weeks followed by occupational therapy consisting of passive and active range of motion (ROM) exercises and adjunctive therapies to control edema and optimize scar tissue. Inadequate management of such injuries could be highly detrimental to hand function.

Introduction

Injuries to the hand and wrist account for 20 % of visits to emergency departments [4]. Despite the high representation of finger injuries, open metacarpophalangeal (MCP) joint dislocations are unusual. MCP joint dislocations are rare because of the strong connective tissue support around the joint [2] and the basal location in the hand.

In this study, we report the case of a 62-year-old man who fell from a height of 10 m onto his left outstretched hand, resulting on an open dorsal MCP joint dislocation of the four long fingers. We performed a literature review of open dorsal MCP joint dislocations in order to elucidate the best treatment options and prognosis. This is the fifth case of such an injury reported in the literature and the first in Canada.

Case Report

This is the first Canadian case of open MCP joint dislocation involving the four long fingers. The patient, a 62-year-old man, was cutting branches from a tree when he lost balance and fell from a height of 10 m onto his left outstretched hand. The forceful hyperextension resulted in a full thickness soft tissue defect at the distal palmar crease and a dorsal dislocation of the index, middle, ring, and small finger (Fig. 1). On physical examination, there were no signs of neurovascular compromise. There were no hand fractures on radiological

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Fig. 1 AP view of the injury intraoperatively

imaging; however, the patient was found to have an ipsilateral scapular bone fracture.

There was no attempt to reduce the dislocation in the emergency room. The patient was brought to the operating theater, and a brachial plexus block was performed for surgical anesthesia. We operated under tourniquet control in order to allow for a bloodless field and, thus, a careful evaluation of the traumatized structures. After extensive wound irrigation, the neurovascular pedicles were explored and were found to be intact. On inspection, the cartilaginous surfaces of the metacarpal head and phalangeal base were undamaged. Each MCP joint was then reduced with light traction and joint flexion in an ulnar to radial direction by flexing the proximal phalanx. There was no soft tissue noose surrounding the metacarpal head, and reduction was facile. The A1 pulley was intact, and release was not required. Importantly, the volar plates (VPs) were all torn. Each VP was repaired with two figure-of-eight stitches, using 4-0 polyester (Ethibond®). To facilitate suture placement and efficiency, all sutures were placed and then tied. There was neither tension on the repair nor instability of the MCP joint intraoperatively. Adequate joint position was confirmed with C-arm fluoroscopy. The wound was closed with 4-0 Vicryl rapid vertical mattress sutures. The tourniquet time was 60 min, and there were no complications.

After closure, a dorsal blocking splint was applied for 2 weeks. After 2 weeks, gentle full active range of motion was started. Two months after the injury, the patient presented with full active and passive range of motion (ROM) (Fig. 2, Video 1).

Methodology

We obtained patient written consent to have the information of the surgical procedure and management as well as the photographs and a video published in print and/or via Internet for publication in a journal and/or presented at a conference.

Fig. 2 AP view of the hand in active flexion after surgery

For the literature review, articles were identified in Embase (1947–2013), MEDLINE (1946–2013), and PubMed (1950–2013). All results were compiled into an EndNote library. The 102 included articles were classified as either open or closed and as mono- or polyarticular (Fig. 3).

Results

In our literature review of 102 articles, only 4 % are of open MCP joint dislocations and involve the four long fingers, while 89 % are of closed MCP joint dislocations. Refer to Fig. 3.

Presentation and Demographics

All reported open MCP dislocations of the four long fingers are dorsal and secondary to a fall on an outstretched hand resulting in a hyperextension injury. Incidence is similar for the right and left hand. No bilateral injuries have been reported, and no association between hand dominance and hand injured is identified. All reported patients are male. All studies, except that of Wright, report concomitant fractures [3, 5, 8].

Management

Uhring et al. [8] is the only study to attempt preoperative traction reduction; all other studies treated the injury directly in the operating room. Uhring et al. [8] also reported significant postoperative MCP joint stiffness, restarting physiotherapy 4 months post-op and placing a permanent perineural catheter.

The three approaches reported for the surgical management of open dorsal MCP joint dislocations are conservative treatment with reduction [3, 5, 10], open treatment and repair of the VP with sutures (our case), and repair of the VP with bony fixation anchors [8]. Most cases (including our case report) involved VP

Fig. 3 Graphic representation of the literature review and publication distribution among MCP joint dislocations

damage. Wright [10] is the only case which did not discuss repairing VP damage, but reported satisfactory results.

VP repair with figure-of-eight sutures had the best results. At 2 months, figure-of-eight sutures approach achieved 68° MCP joint flexion (39 % improvement) and 90° active ROM (range of motion) vs 30° MCP joint flexion [5]. The figure-of-eight suture approach reports the highest active MCP joint ROM. Bony fixation anchors for VP repair had the worst active ROM (69°). In cases of no VP damage, simple traction and reduction had satisfactory results. Refer to Table 1.

Postoperative Management

Patients were immobilized or received a blocking splint. Best outcomes were with a dorsal blocking splint, excluding the study of Uhring et al. [8]. Immobilization and a volar splint were associated with decreased ROM [3, 5]. Refer to Table 1.

Most studies report starting physiotherapy 2 to 3 weeks after surgery. Only Uhring et al. [8] started physiotherapy immediately after surgery. All studies report active and passive ROM exercises; however, no other case describes using

adjunctive therapies (temperature contrast baths, daily scar massage, and nighttime compression gloves with moisturizing cream).

Outcome

Although studies employed different outcome measures, all studies report satisfactory and functional outcomes (Table 1).

Discussion

Appropriate treatment and knowledge of hand injuries is of paramount importance to limit the impact on physical and mental health. Despite prompt treatment, hand injuries can lead to high health-care cost and in prolonged time off work [1, 7, 9]. It is worth noting that the cost in productivity due to work absenteeism from injuries is frequently larger than the health-care cost for treatment [6]. It is crucial to determine the best treatment to allow patients to regain full functionality and return to work as soon as possible.

Table 1 Open MCP joint dislocations of the four long fingers

Article	Year	Country	Patient	Injured hand	Dominant hand	Position of dislocation	Surgical treatment	Splinting/or immobilization	Rehabilitation	Concomitant injury	Outcome measures
Fraser et al. [3]	1995	USA	15 years old, M	R	–	Dorsal	-Conservative treatment with traction reduction -General anesthesia	3 weeks -45° MCP immobilization -Free IPJs	–	L olecranon process fracture	2 years post-op -72° avg ROM of MCP joint
McCarthy [5]	1980	USA	58 years old, M	R	R	Dorsal	-Conservative treatment with traction reduction	3 weeks -45° MCP joint -IPJs neutral	3 weeks post-op -Active and passive mobilization -Dynamic MCP flexor hinge splint	Comminuted supracondylar fracture of the humerus	2 months post-op -30° avg MCP joint flexion 6 months post-op -76° avg MCP joint flexion
Uhning et al. [8]	2012	France	53 years old, M	L	R	Dorsal	-VP damage -VP entrapment -MCP joint reduction by longitudinal incision of four VPs -Open treatment and repair of VP with bony fixation anchors	-Dorsal blocking splint	Immediate -Active mobilization Post 4 months -Significant stiffness; permanent perineural catheter was placed for sustained rehabilitation -Flexible splint	Frontal hematoma and frontal bone fracture	4 months post-op -Significant MCP joint stiffness 2 years post-op -69° avg MCP joint flexion -69° avg active ROM -79° avg passive ROM
Wright [10]	1985	USA	79 years old, M	L	R	Dorsal	-VP damage -VP entrapment -Conservative treatment with traction reduction (VP repair not discussed) -General anesthesia	2 weeks -60° MCP joint dorsal extension blocking splint	2 weeks post-op -Mobilization exercises	–	4 months post-op -235° avg TAFM of 4 long fingers -90 % of contra lateral MCP joints
Our case	2013	Canada	62 years old, M	L	R	Dorsal	-VP damage -Open treatment with repair of VP with sutures -Wide awake hand surgery with brachial plexus block	2 weeks -30° MCP joint flexion dorsal blocking splint	2 weeks post-op -Active and passive mobilization exercises -Compression glove with moisturizing cream at night -Scar massage -Temperature contrast baths	Scapular fracture	11 days post-op -49° avg active MCP joint flexion -59° avg active MCP joint ROM 2 months post-op -68° avg MCP joint flexion (39 % improvement) -90° avg active MCP joint ROM (53 % improvement)

M male, R right, L left, ROM range of motion, TAFM total active finger motion, VP Volar plate, IPJ interphalangeal joint, avg average

Only four open dislocations of the MCP joint of the four long fingers have been published since 1946. We found that 8 % of MCP joint dislocation publications are open and that open MCP joint dislocations of the four long fingers are only 4 % of all MCP joint dislocation publications. Open MCP joint dislocations of the four long fingers occur secondary to high-energy impact on an outstretched hand. Although open MCP joint dislocations are visually impressive, treating physicians should not be sidetracked from trauma protocols; one must rule out the presence of concomitant limb injuries, as these are present in most cases.

All cases reported were promptly treated on the day of injury, most likely contributing to favorable outcomes. Reduction in these cases was either attempted preoperatively or only intraoperatively. We suggest attempting reduction in a controlled operating room setting. This allows for adequate analgesia, extensive irrigation, and exploration of the VP, neurovascular bundles, and flexor tendons.

Intraoperative management had three approaches: conservative treatment with reduction, open treatment and repair of VP with sutures, and repair of the VP with bony fixation anchors. There is insufficient number of cases for a treatment algorithm. Based on available reports and our experience, we suggest addressing this injury intraoperatively with minimal delay and discourage preoperative attempts to reduce the injury. Most cases will be associated with VP injury, and we encourage its repair with figure-of-eight stitches. Postoperatively, we suggest a dorsal blocking splint for 2 weeks (avoid complete immobilization). Occupational therapy consists of passive and active ROM exercises as well as adjunctive therapies to control edema and optimize scar tissue.

In our case, we attribute our optimal results (an average of 90° of active ROM 2 months post-op) to four main characteristics of our approach. First is acute surgical intervention. Second is no extra-operative attempt to reduce the dislocation. This limits potentially traumatic reduction attempts, further damage to the cartilaginous surfaces, or even creation of a noose around the MCP head from excessive traction. Volar plates are torn and easily interposed in the joint space. Third, cartilaginous surfaces were intact and there was no other

associated injuries (flexor tendon, neurovascular bundles intact), and fourth is early mobilization and occupational therapy.

Conflict of Interest Julian Diaz Abele declares that he has no conflict of interest.

Stephanie Thibaudeau declares that she has no conflict of interest.

Mario Luc declares that he has no conflict of interest.

Statement of Human and Animal Rights Procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 and 2008.

Statement of Informed Consent Written patient consent was obtained for publication of the surgical procedure, management, photographs, and video clip.

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