Review Article

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Management of Non-thumb Volar Metacarpophalangeal Joint Dislocations: Case Series and Review of Literature

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Abstract

Volar metacarpophalangeal (MCP) joint dislocations are uncommon yet clinically significant injuries that pose diagnostic and therapeutic challenges. This review synthesizes current knowledge regarding the mechanisms of injury, classification, treatment modalities, outcomes, and complications associated with volar MCP joint dislocations. Insights from 2 case studies, along with previously published case reports, literature reviews, and clinical experiences, are incorporated to provide a holistic understanding of these complex injuries. The review also highlights areas for future research to enhance clinical outcomes and optimize patient care.

Keywords: volar metacarpophalangeal, dislocation, metacarpophalangeal joint, orthopedic surgery, hand

Introduction

Volar metacarpophalangeal (MCP) joint dislocations represent a subset of hand injuries that, although rare, can lead to significant functional impairment if not promptly and appropriately managed. Here, we present 2 cases of non-thumb volar MCP joint dislocation injuries, describing the surgical repair, postoperative care, and patient outcomes. This report aims to incorporate these findings with the current literature to elucidate the current understanding of volar MCP joint dislocations through the synthesis of evidence from published case studies, literature reviews, and clinical experiences.

Results

Case Presentation 1: Volar MCP Joint Dislocation of the Little Finger

In early January 2024, an 84-year-old man fell while at home and suffered a closed volar dislocation of the left little finger MCP joint. The patient presented in the clinic a few days later with pain and gross deformity of the left hand. There was a large prominence over the dorsal ulnar hand representing the head of the little finger metacarpal. The physical examination showed an obvious volar dislocation of the MCP joint, which was subsequently confirmed by radiographs (Figure 1). The neurovascular examination was intact. An initial attempt at closed reduction was unsuccessful. Thus, the decision was made to perform an open reduction. The patient underwent an open reduction of the MCP joint volar dislocation with dorsal capsule (DC) and collateral ligament repair (ulnar and radial) and pinning of the MCP joint under local anesthesia with sedation. A dorsal longitudinal incision was made over the MCP joint, and dissection was performed through the skin and subcutaneous tissue to expose the metacarpal head. It was completely stripped of soft tissue circumferentially. A large soft tissue segment on the radial side, including the flipped radial collateral ligament (RCL) along with the extensor tendons and DC, obstructed reduction. These structures were pulled out of the joint to allow for joint reduction. The RCL and DC were attached to the proximal phalanx. There was a longitudinal tear of the ulnar sagittal band (SB).

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Supplemental material is available in the online version of the article.

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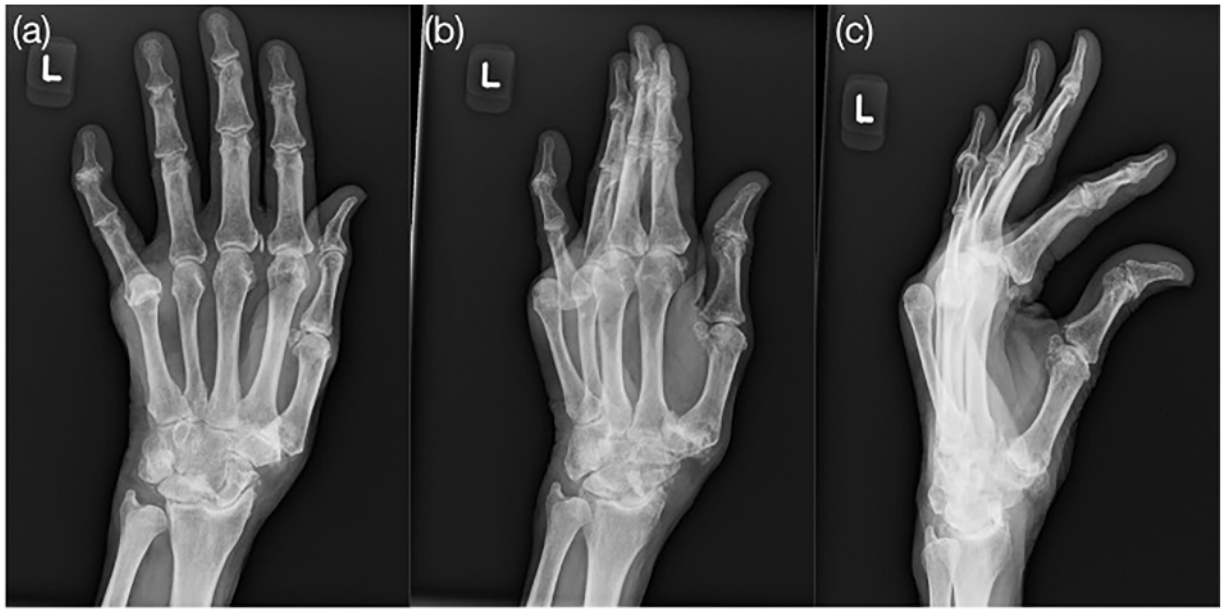

Figure 1. Preoperative left hand (a) posteroanterior radiograph, (b) lateral-oblique radiograph, and (c) lateral radiograph demonstrating closed volar dislocation of the left little finger at the metacarpophalangeal joint.

The remaining portions of the DC and ulnar collateral ligament (UCL) complex were also attached to the proximal phalanx. The volar plate (VP) was split longitudinally, with each side still attached to the proximal phalanx. Due to the difficulty in maintaining reduction in flexion, the MCP joint was anatomically cross-pinned in extension, and the 0.045 k-wires were cut below skin level. Both RCL and UCL, as well as the DC, were repaired to the metacarpal origin with bone anchors using 4-0 FiberWire. Nano anchors were used to secure the origins of the collateral ligaments, and a corkscrew anchor was placed on the dorsal metacarpal head-neck junction to repair the DC. The abductor digiti quinti was released to alleviate ulnar tension. The VP was not repaired. The extensor tendons were centralized dorsally and secured by repairing the ulnar SB longitudinal rupture using several 4-0 nonabsorbable sutures. A dry sterile bandage and splint were applied to support the little and ring MCP joint in extension, wrist in neutral and interphalangeal (IP) joints were left free.

A few days after the surgery, during the first postoperative visit, the patient was advised to use a custom orthoplast splint similar to the one applied after surgery. Radiographs demonstrated stable reduction and cross-pinning (Supplemental Figure S1).

Three weeks post-surgery, the patient returned to the surgery center for removal of the hardware and assessment of the range of motion (ROM) of the left little finger. Local anesthesia was used with lidocaine and epinephrine. Radiographs confirmed the proper alignment of the joint. A small incision was made over the ends of the pins, and they were successfully removed. The MCP joint was gently flexed, achieving approximately 70° of flexion, and the patient was actively able to make a fist within 5 mm of the distal palmar crease (Supplemental Video S1). There was no MCP joint volar translation with active flexion and extension (Supplemental Video S2).

A few days after hardware removal, occupational therapy was started, which included active and gentle passive ROM of the MCP and IP joints. The ulnar gutter splint was used when not in therapy or engaged in home therapy. Radiographs showed a reduced MCP joint. Anchors placed intraoperatively appeared in the correct position (Figure 2). The ulnar gutter splint was discontinued 6 weeks postoperatively, and he was transitioned to buddy tape for another 6 weeks to protect the mild RCL laxity.

Two months after the index procedure, the patient reported no significant changes and had active MCP joint ROM of 0° to 45°.

Three months post-surgery, he continued to improve only using the buddy strap for strenuous exercises. He had minimal tenderness at the MCP joint. Radiographs showed maintenance of alignment.

At 4 months, he had no pain on physical examination, with active ROM of 0° to 80° at the MCP joint and the ability to make a composite fist (Supplemental Video S3). There was no laxity on the ulnar side, but mild laxity when

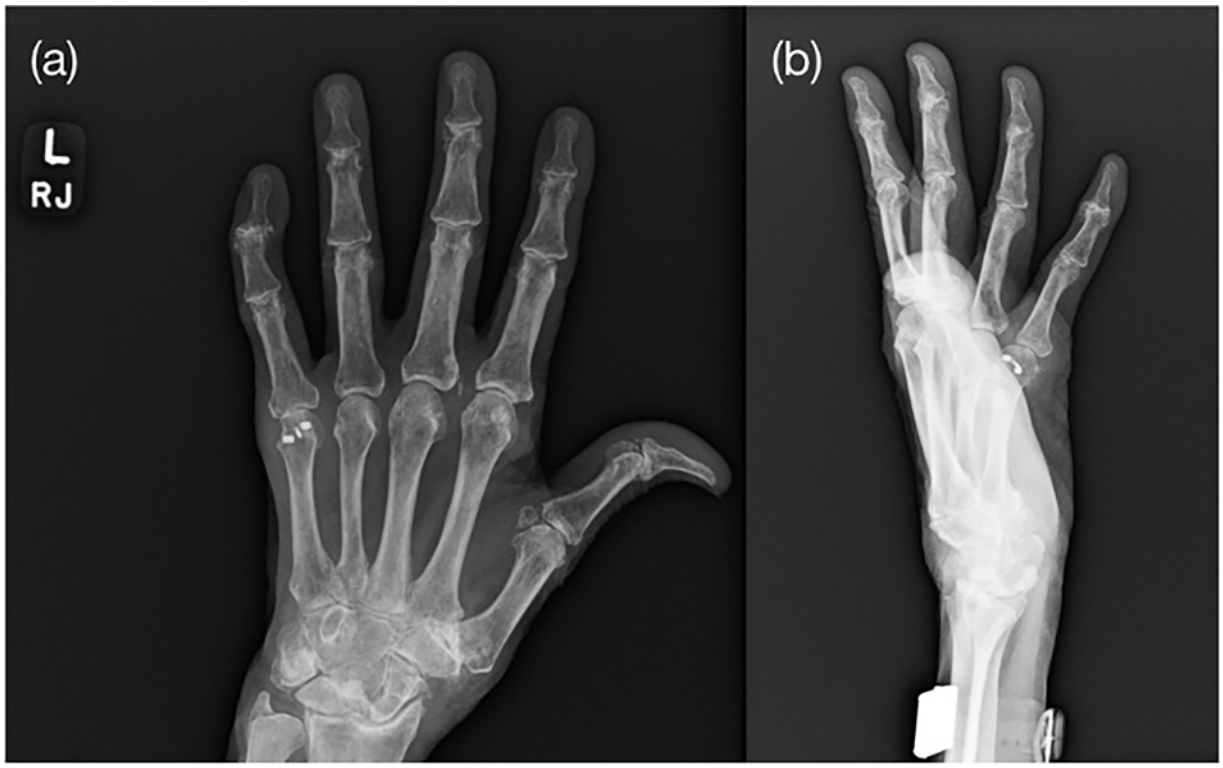

Figure 2. Six-week postoperative (a) posteroanterior and (b) lateral radiograph demonstrating a reduced metacarpophalangeal joint of the left little finger. Nano and corkscrew anchors placed intraoperatively are in the correct position.

testing the RCL in flexion. He completed occupational therapy. Interphalangeal ROM of the ring and little fingers was full.

Case Presentation 2: Volar MCP Joint Dislocation of the Index Finger

A 60-year-old, right-hand dominant man sustained multiple injuries from a motor vehicle accident including a volar MCP joint dislocation of the right index finger (Figure 3). Initially, the patient was treated with a closed reduction and splint (Supplemental Figure S2). However, the MCP joint ended up re-displacing while in a splint, which ultimately prompted the patient to undergo percutaneous pinning of the MCP joint 3 days after re-displacement had occurred (Supplemental Figure S3). The percutaneous pins were removed 1-month post-surgery. The patient engaged in a home therapy program. At 2 months post-surgery, the MCP joint was found to be subluxed volarly (Supplemental Figure S4).

Despite being told that the pain would dissipate with time, the patient experienced progressively worsening pain. This prompted a second opinion evaluation at 8 months post-surgery. On examination, the right index MCP joint was noted to be tender and swollen, achieving only 45° to 80° of motion both actively and passively with pain at both extremes. The IP joints were notably stiff, but motion did not elicit pain. The index finger had rotational instability with flexion, as demonstrated by the index finger under the long finger. In addition, the finger had greater laxity to the RCL compared with the UCL. Subsequent radiographs demonstrated traumatic arthritis and MCP joint subluxation (Figure 4). The patient is now considering an MCP joint arthrodesis.

Cases in Literature

This study found 15 case reports of non-thumb volar MCP joint dislocations published from 1965 to 2022.[1-13] Of these, there were 2 injuries of the index finger MCP joint, 4 long finger injuries, 5 ring finger injuries, and 4 little finger injuries. Most cases required surgical reduction, with only 2 dislocations definitively managed by closed reduction. Closed reduction was attempted for 3 injuries before proceeding with open reduction.

Postoperative ROM varied but was generally good. Several cases reported full ROM with no disability at follow-up

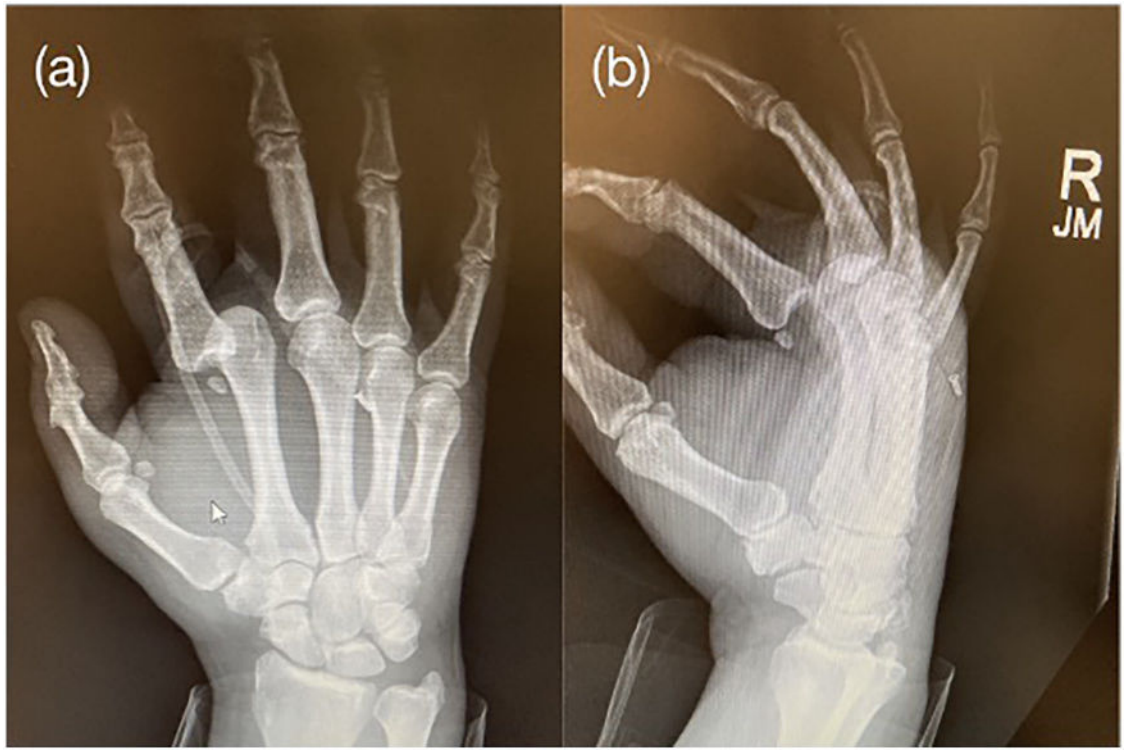

Figure 3. Preoperative right hand (a) posteroanterior radiograph and (b) lateral radiograph demonstrating closed volar dislocation of the right index finger at the metacarpophalangeal joint at the time of initial injury.

Figure 4. Eight-month postoperative (a) posteroanterior, (b) lateral-oblique, and (c) lateral radiographs demonstrating notable volar subluxation of metacarpophalangeal joint of the right index finger with traumatic arthritis.

intervals ranging from 5 weeks to 21 months. Some patients experienced mild discomfort or slight pain, but these did not appear to significantly affect function. One case noted persistent stiffness and osteoarthritis. An implant was used in the management of 1 patient, which provided pain relief and 60° MCP motion.

Patients undergoing early mobilization had better functional recovery, as seen in the cases of Srivastava and Afaque[2] and Paul et al.[8] Those who had delayed intervention or loss to follow-up had less well-documented outcomes.

Clinically, the limited data suggest that patients can expect a high likelihood of pain relief and functional recovery, with most regaining near-full ROM. However, some may experience residual stiffness, mild pain, or arthritis over time, particularly if the injury requires multiple surgeries or prolonged immobilization. Early motion and rehabilitation appear to be key factors in optimal outcomes. Further findings have been summarized in Table 1.

Discussion

Epidemiology and Mechanisms of Injury

Volar dislocation of the MCP joints is rare. Overall, dorsal MCP joint dislocations are much more common.[14] The rarity of volar MCP joint dislocations is highlighted by the limited reporting in current literature. When reported, volar MCP dislocations have occurred during trauma-related events, such as falls on outstretched hands, bicycle accidents, and motor vehicle collisions. Cadaver studies have shown that the mechanism of volar MCP dislocation may result from trauma to the dorsum of the hand with the MCP joint acutely fixed,[11] hyperflexion of the MCP joint, or dorsal blow to the proximal phalanx in flexion (such as striking a wall with a clenched fist).[1,15]

Pathological Anatomy

Biomechanical testing has shown the primary stabilizers of the MCP joint to be the radial and ulnar proper collateral ligaments, particularly to volar and dorsal translation.[16] They originate from the dorsal aspect of the metacarpal head and insert on the volar aspect of the base of the proximal phalanx. The VP provides minimal stabilization to volar translation.[16] The accessory collateral ligaments also provide minimal dorsopalmar stability.[16] They originate volar to the proper collateral ligament and insert on the VP. The VP is much thicker at its distal attachment at the base of the proximal phalanx and thinner and more membranous at the attachment on the metacarpal neck. The DC is quite thin and also a weak MCP joint stabilizer.[16]

The pathological anatomy involved in volar MCP dislocation injuries may include DC tear, a tear of one or both of the RCL or UCL, and/or a tear of the VP.[11] Anatomical and biomechanical testing demonstrates the ulnar SB is usually thicker than the radial and that complete sectioning of the ulnar SB alone does not result in radial dislocation of the extensor tendons.[17] Although radial SB injuries and ulnar instability of the extensor tendons is most common, particularly in the central digits, circumferential complex soft tissue damage seen in volar MCP dislocation may result in the uncommon ulnar SB disruption with radial extensor tendon instability as seen in Case 1. Just like with knee dislocations, these devastating volar MCP dislocation injuries are associated with a variety of soft tissue injury patterns based on the injury forces. It was also found that patients with volar MCP dislocations are typically older than those with dorsal MCP dislocations.[11]

Successful reduction of volar MCP joint dislocations may be blocked by interposed soft tissue in the MCP joint. One summary of MCP joint dislocation management identified the VP and DC as common blocks to reduction.[15] Betz et al[5] identified both the VP and UCL blocked reduction, and Wood and Dobyns[1] noted the interposed DC blocked reduction. Reduction in Case 1 of our review was blocked by the RCL, DC, and extensor tendons.

Classification and Management

There is currently no classification system for non-thumb volar MCP dislocations. Senda and Okamoto[18] described a 3-tier classification system for volar MCP dislocations of the thumb: type A which are stable after closed reduction, type B requiring open reduction because of a soft tissue block, and type C which are unstable after closed reduction and require ligament repair. The lack of a non-thumb volar MCP dislocation injury classification system begs for future research on non-thumb volar MCP dislocation cases to be published.

In current practice, there is not a consensus on a treatment approach for volar MCP dislocation injuries. Closed reduction of volar MCP dislocation has a high rate of recurrent dislocation even with pinning[1] just like we experienced in Case 2. The culprit for failure of closed reduction of a dislocation of the MCP joint is likely the interposition of soft tissue or nonanatomical position of the collateral ligaments.[1,5] The longer the delay before surgical intervention, the more difficult it is to identify the type and degree of ligamentous injury.

Surgical Approach and Postoperative Care

Although a small subset of volar MCP dislocations have been successfully treated with closed reduction, many structures have been identified as possible barriers, including interposed extensor tendons, entrapped VP, RCL, and UCL.[1-5,7,8,10,11,13] The severe circumferential soft tissue

Table 1. Published Case Reports of Non-thumb Volar MCP Joint Dislocations.

Source	Publication year	Age	Sex	Mechanism of injury	Finger	Reduction	Surgical approach	Outcome
Wood and Dobyns[1]	1981	17	F	MVA	Index	2 closed reduction attempts (first following initial injury; second repeated 2 weeks later with Kirschner wire) Eventually, open reduction	Dorsal	Satisfactory arthrodesis of the index MCP joint was achieved. 1-year post-op: patient was pain free and had returned to all former activities using her left hand
Srivastava and Afaque[2]	2022	13	M	FOOSH (Sports)	Index	2 closed reduction attempts Eventually, open reduction	Dorsal	6-month f/u, radiographs confirm stable MCP reduction, child regained "an almost normal range of motion at the MCP joint with a good functional outcome." Early management and mobilization provide good functional outcomes
McLaughlin[3]	1965	Unk	Unk	Unk	Long	Open reduction	Dorsal	Not reported
Wood and Dobyns[1]	1981	20	M	MVA	Long	Closed reduction attempted Open reduction 2.5 weeks after the injury	Dorsal	Immobilized for 3 weeks then lost to follow-up
Wood and Dobyns[1]	1981	61	F	Hyperflexion	Long	Open reduction with Silastic implant	Dorsal	1-year post-op: implant completely relieved pain, ROM of MCP 60° (arc not reported)
Vandeweyer et al[4]	1998	48	F	Hyperflexion (MVA)	Long	2 open reductions	First: Dorsal Second: Volar and Dorsal	1 year; painless, ROM of MCP 0°-80°
Betz et al[5]	1982	70	F	Hyperextension (assault)	Ring	Open reduction	Volar	7 months; full ROM of MCP, no disability
Khuri and Fay[6]	1986	31	M	Hyperflexion (roller skating)	Ring	Closed reduction	N/A	5 weeks; some pain, full ROM of MCP
Qiu[7]	1992	20	M	Hyperflexion (industrial accident)	Ring	Open reduction	Volar and dorsal	21 months; painless, stable, ROM of MCP 20° (arc not reported), osteoarthritis
Paul et al[8]	1995	22	M	Biking accident	Ring	Open reduction	Volar	Passive ROM started at 4 weeks, active ROM started at 8 weeks. 1-year post-op; complete ROM of MCP joints of both fingers
Ramzi et al[9]	2018	30	M	Hyperextension (Motorcycle accident)	Ring	Closed reduction	N/A	Long term f/u—no pain and full ROM of MCP
Renshaw and Louis[10]	1971	48	M	Hyperextension (a heavy object hyperextended the finger)	Little	Open reduction	Volar	15 months; ROM of MCP 10°-70°, no disability
Moneim[11]	1983	59	M	Hyperflexion (fall while running)	Little	Open reduction	Volar and dorsal	7 months; pain slight, ROM of MCP 0°-70°, ROM of PIP 10°-80°
Hargarten and Hanel[12]	1992	66	M	Hyperflexion and volar translational (fell)	Little	Open reduction	Not described	1 year; ROM of MCP 60° (arc not reported), mild discomfort
Patel and Bassini[13]	2000	71	M	Hyperflexion and volar translational	Little	Open reduction	Dorsal	12 weeks; ROM of MCP 20°-75°, ROM of PIP and DIP were full; MCP stable, no pain, no disability

Note. MCP = metacarpophalangeal; PIP = proximal interphalangeal; DIP = distal interphalangeal; MVA = motor vehicle accident; f/u = follow-up; FOOSH = fall onto outstretched hand; Unk = unknown; ROM = range of motion.

stripping of the metacarpal, which was observed in Case 1, is analogous to multi-ligament tearing seen in knee dislocations. Of the few cases of volar MCP dislocation reported in the literature, most, including us, suggest a dorsal surgical approach for open reduction because it has a lower risk of injury to the neurovascular bundle, is more versatile for repair of associated injured structures, and decreases the likelihood for needing a second incision on the volar aspect.[2,19] Betz et al[5] initially approached a volar MCP dislocation volarly, but after successful repair of the VP was unable to maintain the reduction, thus questioning the role of the VP in volar stability. A second incision was required dorsally, which identified and addressed the trapped UCL. A volar approach would be required for VP repair. However, it is our opinion that if all other soft tissue structures are repaired, an essentially isolated VP rupture can be ignored, thus avoiding the risks associated with a second exposure. This view is supported by the biomechanical work of Minami et al,[16] which showed the collateral ligaments are the main stabilizers to volar MCP displacement.

Wood and Dobyns[1] noted a recurrent volar MCP dislocation after closed reduction and pinning for 3 weeks. Even if a closed reduction is achieved, as in Case 2, we suggest surgery to anatomically repair the soft tissue stabilizers. This recommendation most reliably restores normal anatomy and provides the best stability so that an early ROM protocol can be used to avoid stiffness, a concept similar to the one adopted for treating knee dislocations.

Regardless of surgical approach, postoperative management of patients recovering from volar MCP dislocations is imperative, with most of the literature supporting the idea that early mobilization and therapy are important factors in a patient's success. More specifically, the stress on the repaired ligaments with early ROM enables biochemical remodeling.[2] While papers reporting open reduction of volar MCP dislocations agree that early mobilization is important, there is no consensus regarding the optimal post-op immobilization period before starting therapy, with published literature recommending as little as 3 weeks.[2] In our opinion, after surgical stabilization, there should be enough healing at 3 to 4 weeks to allow for pin removal and early, protected ROM to minimize the risk of stiffness and residual instability. Articular k-wires are commonly used for mallet and boutonniere stabilization, VP arthroplasty, and ligament stabilization procedures and have not been found to cause articular damage, so we are not concerned one or two 0.045 pins will cause long-term cartilage damage, particularly if buried and removed by 4 weeks.

Excluding patients requiring fusion, implant arthroplasty or with less than 3 months follow-up, overall, outcomes following open reduction of volar MCP joint dislocations demonstrated decreased pain and functional MCP motion.[1,2,4,5,7-10,13]

Limitations and Future Research

In this report, we conducted a review of peer-reviewed, English literature related to volar MCP joint dislocations, excluding injuries to the thumb. This report has some limitations. First, this article only assessed cases published in English, limiting cases published in other languages. Second, this report may have missed other cases currently in the process of publication as well as cases that were not published at all. Third, our impressions are based mainly on the 2 cases presented within this article and the limited literature, thus a potential sample size bias exists. Finally, Case 1 had mild residual RCL laxity, which could have resulted from suboptimal tissue quality, incomplete healing, inadequate protection after pin removal, or nonanatomical repair yet we do not know with certainty the actual reason.

We acknowledge that treatment practices are highly variable due to the limited number of cases and propose the need for multicenter case registries and/or prospective studies.

Conclusions

Non-thumb volar MCP dislocations are rare and typically result in significant and variable ligamentous injuries. Closed management is associated with a high failure rate, so we suggest surgical stabilization and ligament repair to provide the best opportunity for a stable, functional MCP joint. Our preferred surgical exposure is dorsal. Early MCP ROM at 3 to 4 weeks postoperatively optimizes ROM, function, and patient satisfaction. Further research may help establish standardized classification systems and treatment protocols for these challenging injuries.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

The authors declare that this research was conducted in accordance with the Helsinki Declaration of 1975, as revised in 2008 (5).

Statement of Informed Consent

Informed consent was obtained from all individual participants included in these case reports.

Declaration of Conflicting Interests

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