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CASE REPORT
Reconstructive

Volar Dislocation of the Index, Middle, and Ring Carpometacarpal Joints: A Review

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Summary: Dislocation of the index, middle, and ring carpometacarpal joints is an extremely rare injury pattern, with a paucity of published cases. We reviewed the literature and analyzed our own experience to familiarize clinicians with this rare condition through discussion of its clinical presentation, diagnostic considerations, and management. We present the rare case of volar-radial dislocation of the index, middle, and ring carpometacarpal joints in a 61-year-old woman. She underwent a closed reduction with percutaneous Kirschner wire fixation and regained a painless full range of motion after 12 weeks. Dislocation of a carpometacarpal joint is an uncommon injury and can be easily missed. A lateral roentgenogram is essential to accurately identify this injury. Reduction should be achieved as soon as possible, and maintaining reduction with internal fixation is often required due to the acquired instability of the joint. A full return to preinjury status can be expected in most cases. *(Plast Reconstr Surg Glob Open 2015;3:e330; doi: 10.1097/GOX.0000000000000297; Published online 18 March 2015.)*

Dislocation of a carpometacarpal (CMC) joint is rare and occurs in less than 1% of all hand injuries.[1] Although dislocations of the thumb and little finger metacarpals are well recognized, there is a paucity of published literature on those involving the other metacarpals. We present a case of traumatic dislocation of the index, middle, and ring metacarpals, an injury pattern which has only been reported 4 times previously, to our knowledge, in the English literature.[2,3] We reviewed the literature and analyzed our own experience to familiarize clinicians with this rare condition through discussion of its clinical presentation, diagnostic considerations, and management.

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Received for publication January 8, 2015; accepted January 30, 2015.

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DOI: 10.1097/GOX.0000000000000297

CASE REPORT

We report the case of a 61-year-old right-hand dominant female nurse who dislocated the index, middle, and ring CMC joints of her left hand via an unusual mechanism. The patient accidentally fell out of the driver's seat of her parked car and got her left hand caught in the seatbelt. The car, with the handbrake off, began to roll forward and drag the patient by the hand for approximately 5 m before she untangled herself. She had instant pain and swelling of her left hand and had some minor abrasions on her face.

Examination revealed significant swelling of her left hand and a superficial laceration overlying the dorsal aspect of the ring metacarpal. The hand was diffusely tender over the CMC area and was neurovascularly intact. Roentgenograms showed volar-radial dislocation of the index, middle, and ring metacarpals at the CMC joints (Fig. 1). The metacar-

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

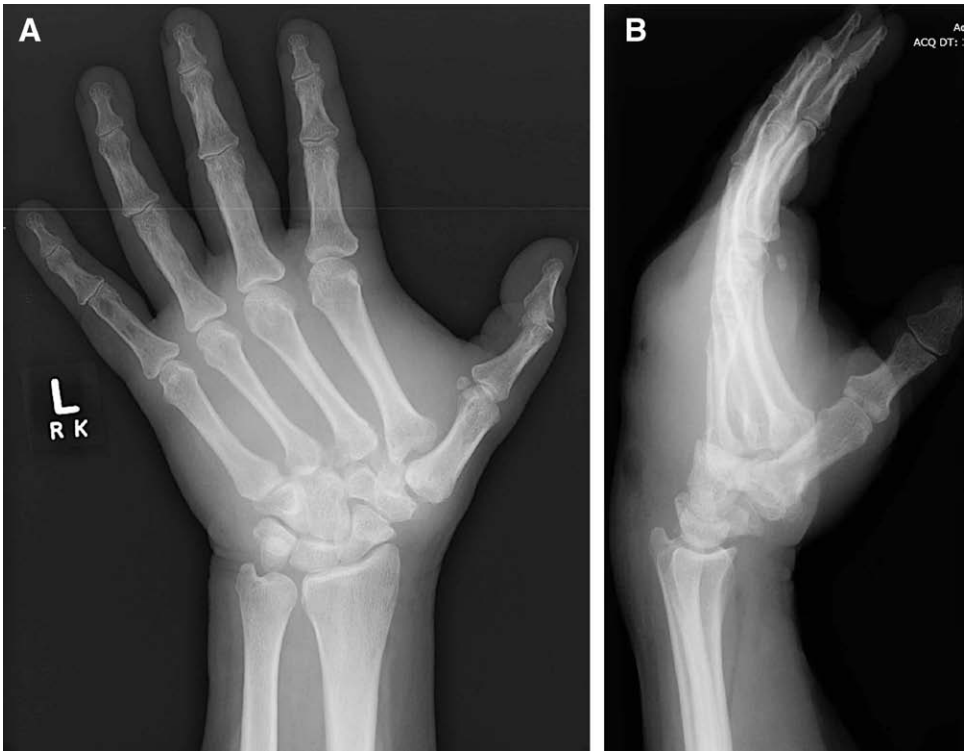

Fig. 1. Initial x-rays: Anteroposterior (A) and lateral (B) views.

pals were reduced under procedural sedation, but postreduction roentgenograms showed persistent dislocation of all 3 metacarpals. Computed tomography identified avulsion fractures at the bases of the index, middle, and ring metacarpals.

The patient was taken to theatre 4 days after the injury and underwent a closed reduction with percutaneous Kirschner wire (1.6 mm) fixation, as it was difficult to maintain reduction via closed means alone. First, the index metacarpal was reduced onto the trapezoid via the application of a dorsally directed force to the palm of the hand with longitudinal traction. A Kirschner wire was then inserted through the index metacarpal, capitate, and hamate to maintain reduction. The middle and ring metacarpals were then reduced via the same means, and reduction was maintained via Kirschner wire fixation through the middle metacarpal, capitate, and hamate and through the ring metacarpal and hamate (Fig. 2). The patient was discharged home the day after the operation following an uneventful postoperative period. The reduction was protected for 6 weeks in a short-arm fiberglass cast. This allowed immediate and full mobilization at the metacarpophalangeal joints distally. The Kirschner wires were removed at 6 weeks, and active range of movement exercises were continued under the guidance of a hand therapist.

After 12 weeks, she regained a painless full range of motion and returned to work without limitations. Her Disabilities of the Arm, Shoulder, and Hand scores were 25.3 and 33.3 for the right and left hands, respectively, indicating a nearly full return to her preinjury status. Roentgenograms taken after 12 weeks showed the maintained reduction of the CMC joints with parallel joint surfaces (Fig. 3). Her hand function was unchanged at 6 and 12 months postoperatively.

DISCUSSION

Review of the Literature

A thorough review of the English literature revealed 4 previously published cases of dislocation of the index, middle, and ring CMC joints (Table 1).

Diagnosis

Patients with a CMC joint dislocation usually present with pain, swelling, and impairment of hand function. Dorsal dislocations present with a depression in the palm of the hand and a characteristic "dinner-fork" deformity.[4] Conversely, volar dislocations present with a depression on the dorsum of the hand and may present with a "spade type" deformity. On an anteroposterior roentgenogram, there should be a clear joint space between the carpus and the metacarpal bases, with parallel joint surfaces.[5] With CMC joint dislocations, this joint space is lost due to overlap of the joint surfaces. Fractures at the base of a metacarpal and apparent "shortening" of a metacar-

Fig. 2. Postoperative x-ray: anteroposterior view.

Fig. 3. Follow-up x-ray after 12 weeks.

pal should also arouse suspicion of the possibility of a dislocated CMC joint.[6] A lateral radiograph should clearly show the dislocation and is of most use.

Management

Dislocation of a CMC joint disrupts the normal longitudinal and transverse arches of the palm, and impairs grip strength, so must therefore be reduced.[1] Closed reduction is usually obtained without difficulty if performed early.[4,5] Either general or regional anesthesia can be used, and the reduction technique involves the use of longitudinal traction while direct pressure is applied to the dislocated metacarpal bases.[5] Closed reduction is usually successful in dislocations that are less than 10 days old.[6] In cases that present late, reduction may be very difficult and may only be able to be achieved via open means.[4] This is usually the case for CMC joint dislocations more than 3 weeks old.[2]

In the current case, reduction of the CMC joints was able to be easily achieved by closed means alone; however, the reduction was unable to be maintained and each joint was found to be grossly unstable. This is consistent with other studies and is most likely due to the rupture of the dorsal, volar, and interosseus ligaments.[5,7–9] Consequently, internal Kirschner wire fixation is often required to prevent persistent subluxation of the metacarpal bases, and this was achieved in the current case percutaneously.[4,7]

Following reduction of a CMC joint dislocation, immobilization in a cast should be maintained to allow the soft-tissue structures to heal. There is not a universally agreed time period with which to keep the joint immobilized, and periods of 2–6 weeks have been suggested by previous studies.[1,4,7,10] Following this period of immobilization, hand therapy should be employed to ensure restoration of joint range of motion.[4]

Prognosis

Despite their apparent severity, these injuries have a good prognosis and this is independent of whether the reduction was achieved via open or closed means.[1,6] The patient in the current case experienced a near full return to her preinjury status, with Disabilities of the Arm, Shoulder, and Hand scores of 25.3 and 33.3 for the right and left hand, respectively. Excessive ligament laxity, as seen in the CMC joint dislocations, predisposes these joints to degeneration of the articular cartilage and early osteoarthritis.[8,9]

The inherent immobility of the CMC joints, especially the middle 3, means that they contribute

Table 1. Cases of Dislocation of the Index, Middle, and Ring CMC Joints

Author	Patient	Injury	Mechanism of Injury	Treatment	Outcome
Hazlett[3]	46, male	Volar dislocation and fracture of the base of the index MC Dorsal dislocation of the middle and ring CMC joints Trapezoid fracture Distal radius fracture	Caught hand in feeder mechanism of garbage truck	Fusion of the index CMC joint Internal fixation of the middle MC and capitate	No symptoms after 18 mo
Hazlett[3]	33, male	Dorsal dislocation of the index, middle, and ring CMC joints	Fell down a flight of stairs	Closed reduction and plaster fixation	Satisfactory
Hazlett[3]	19, female	Dorsal subluxation of the index, middle, and ring CMC joints Fracture of the little finger MC	Motor vehicle accident	Open reduction, internal fixation of the index, and middle CMC joints	No deformity, no symptoms
Jameel et al[2]	40, male	Volar-radial dislocation of the index, middle, and ring CMC joints	Motorbike accident	Closed reduction, internal fixation with percutaneous Kirschner wires, and a mini external fixator	Restoration of normal function at 6 wk

MC, metacarpal.

more toward the stability than the mobility of the hand. Any loss of mobility can be compensated for by the midcarpal and radiocarpal joints, and a full return to preinjury status can be anticipated in most cases.[1,6]

CONCLUSIONS

Dislocation of a CMC joint is an uncommon injury. We describe an unusual case of a 61-year-old woman with volar dislocations of the index, middle, and ring CMC joints, of which only 4 other cases exist in the literature. A lateral roentgenogram is essential to accurately identify this injury. Reduction should be achieved as soon as possible, and maintaining reduction with internal fixation is often required due to the acquired instability of the joint. A full return to preinjury status can be expected in most cases.

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