

Multiple Volar Carpometacarpal Dislocations with Associated Carpal Tunnel Syndrome: A Case Report

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ABSTRACT

We report a rare injury involving volar fracture dislocations of the second to fifth carpometacarpal dislocations. Carpometacarpal dislocations are usually dorsally displaced and most commonly only involve the fourth and fifth joints. An associated carpal tunnel syndrome adds another dimension to the complexity and rarity of the injury in this index case. A high index of clinical suspicion and subsequent emergent management is of utmost importance to treat this unusual combination of injuries in order to avoid significant morbidity.

Keywords: Carpal tunnel syndrome, carpometacarpal dislocation, volar

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INTRODUCTION

Multiple carpometacarpal (CMC) dislocations are rare injuries which are often due to a high energy mechanism of injury (1–3). Carpometacarpal dislocations most commonly affect the fourth and fifth CMC joints (4). Volar dislocations are rarely reported (5). There have been significantly fewer cases in the literature with an associated carpal tunnel syndrome (6). There were no cases found in the literature with multiple volar fracture dislocations with neurological impairment. The index case presented below is therefore of significant interest.

CASE REPORT

A 27-year old right-hand dominant male presented to the St Ann's Bay Regional Hospital 45 minutes after falling out of the back of a pickup van and landing on his outstretched right hand. He complained of having severe pain, swelling and numbness in his right hand.

Examination revealed a young male in obvious painful distress. His right hand was grossly swollen and tender throughout. There was no deformity appreciated due to the degree of swelling. Capillary refill was normal in all fingers, however, light touch sensation was absent in the radial four fingers. Tinels' and Phalen's tests were both positive. Finger and wrist movement was minimal and limited by pain and swelling.

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Anteroposterior and oblique X-rays of the hand revealed loss of parallelism of the metacarpals and obliteration of the second to fifth CMC joints. A lateral view was not done. The bases of all the involved metacarpals were fractured. A diagnosis of i) multiple carpometacarpal dislocations, ii) fractures of the bases of metacarpals 2–5 and iii) associated carpal tunnel syndrome and impending compartment syndrome involving the interosseii was made (Figs. 1–2).



Fig. 1: Preoperative oblique view of the right hand.



Fig. 2: Preoperative antero-posterior view of the right hand.

He was taken to the operating theatre within one hour. Via a volar approach, the carpal tunnel was decompressed by evacuating several millilitres of blood and clots after releasing the flexor retinaculum. The median nerve was found to be grossly normal. Two dorsal longitudinal incisions were placed just medial to the second and fourth metacarpals which allowed for adequate fasciotomies in order to

decompress the dorsal and palmer interosseous compartments of the hand as well as to access the dislocated CMC joints. Several millilitres of blood were once again evacuated. The compartments were found to be tense but established compartment syndrome was not clinically apparent. There was significant disruption of the supporting intrinsic muscles and ligaments, hence providing a minimal internal splint. The second to fifth CMC joints were all volarly displaced. Because of the significant gross instability of the CMCs, we elected to pass the Kirshner wires retrograde across the CMCs with a starting point at the head of the metacarpals for added stability (Figs. 3–5), after reduction of the affected joints was achieved. The wounds were closed with interrupted sutures and a Robert Jones dressing was applied.



Fig. 3: Postoperative oblique view of the right hand.



Fig. 4: Postoperative antero-posterior view of the right hand.

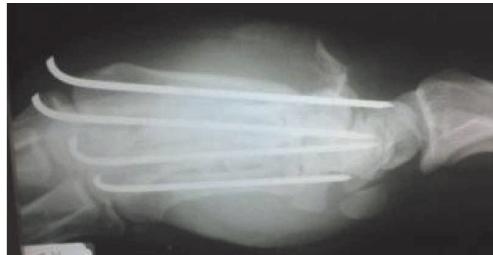


Fig. 5: Postoperative lateral view of the right hand.

Over the next few weeks, there was no evidence of infection, the pain and swelling were markedly less, and sensation had normalized. His wires were removed at seven weeks and aggressive physiotherapy was commenced. Wrist and finger range of motion gradually improved over the next six months (Figs. 6–12).



Fig. 6: Dorsal surface of the right hand one week post surgery.



Fig. 7: Volar surface of the right hand one week post surgery.



Fig. 8: Volar surface of the right hand five months post surgery.



Fig. 9: Dorsal surface of the right hand five months post surgery.



Fig. 10: Patient demonstrating good wrist flexion five months post surgery.



Fig. 11: Patient demonstrating good wrist extension five months post surgery.



Fig. 12: Patient demonstrating good flexion of the 2nd–5th metacarpophalangeal joints five months post surgery.

DISCUSSION

The complex articulation of the CMC saddle joint includes the metacarpal bases articulating with each other, as well as with the distal carpal row in an interlocking manner (7). Stability of the CMC joints is provided by the strong volar, dorsal and interosseous ligaments, long flexor and extensor tendons and the intrinsic muscles of the hand (7, 8). The injury described was grossly unstable due to the complete rupture of the volar ligaments, partial rupture of the dorsal ligaments and significant avulsion of the intrinsic muscles. All tendons were intact.

The articulation between the capitate and third metacarpal is more proximally located than the metacarpal articulations with the other carpal bones (8). This keystone phenomenon is the reason why the third CMC joint is less commonly dislocated than the fourth and fifth because it is relatively fixed and rigid (7). This important and predictable articulation was the first CMC joint to be addressed by reduction and fixation. This made the subsequent reduction and fixation of the other CMC joints technically easier. The Kirshner wires were placed in a retrograde fashion, with a starting point at the head of the metacarpals because there was still instability when they were placed in the usual dorsal to volar direction used by other authors in the literature. We feel this may have been due to the increased instability from the avulsed muscles making the injury more unstable than usual.

Most cases of CMC dislocations documented in the literature are dorsally directed, with far fewer cases of volar dislocations, especially multiple, being reported (9). The direction of the dislocation is determined by the direction of the force which may be transmitted either directly on the metacarpal bases or indirectly on their shafts (6). Multiple dislocations rarely occur without associated fractures of the metacarpal bases because of the numerous static stabilizers (10), as was seen in the index case.

Common mechanisms of injury include motor vehicle accidents, crush injuries, falls (11) and punching (12). A high index of suspicion, detailed examination and quality radiography is of utmost importance (2, 3). This was particularly highlighted in the present case. This injury is not uncommonly missed because of gross swelling, lack of knowledge of this injury and its rarity (3). Even orthopaedic surgeons have been known to miss this injury (7, 12). Missed diagnosis, delayed or inappropriate treatment of this pathology will result in significant morbidity (5, 12). Fisher *et al* (4) reported on a radiographic approach to diagnosis based on the posteroanterior radiographs. This includes an assessment for overlap between articular surfaces, periarticular fractures and significantly angulated fractures (which are commonly associated with dislocations) and loss of parallelism of the metacarpals. The index case had all of those features except for angulated fractures.

The impending compartment syndrome in the 'interosseous compartments' and established carpal tunnel syndrome

necessitated urgent decompression with evacuation of blood and clots in those compartments. Postoperatively, his symptoms dramatically improved.

To our knowledge, there are no reported cases in the literature of acute carpal tunnel syndrome following multiple CMC joint dislocations and only one case reported after dislocations of the fourth and fifth CMC joints (6).

In general, acute median nerve compression is rare following wrist injuries (13). The combination of increasing and severe wrist pain with paraesthesia and impaired sensation in the median nerve distribution should alert the examiner of this rare diagnosis which rapidly develops in a few hours (13). The index case had emergent decompression before the symptomatology fully developed. Several authors in the literature emphasize the need for urgent reduction plus or minus fixation for CMC dislocations in order to avoid morbidity. In our patient, this also was compounded by the fact that delayed decompression of the median nerve would have resulted in intraneuronal fibrosis secondary to tension from the local haematoma, leading to intraneuronal ischaemia and permanent nerve damage and morbidity (14). The dorsal incisions allowed for decompression of the dorsal and palmar interossei compartments which were clinically tense, in addition to accessing the dislocated joints. The avulsions of the intrinsic muscles, which are rarely (if ever) described in the literature with this injury, demonstrated the high energy which was imparted to the hand. Extensive dorsal fasciotomies were performed to facilitate adequate decompression in order to avoid the morbidity associated with a Volkmann's ischaemic contracture from an inadequately treated compartment syndrome.

The early presentation of the patient, accurate diagnosis, recognition of the different variables that may have caused significant morbidity and prompt surgical management all contributed to a good prognosis. The final phase of management which will determine his definitive outcome is physiotherapy.

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