

## A Rare Case of Multiple Traumatic Volar Carpo-Metacarpal Joint Dislocations of the Hand

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### Abstract

**Introduction:** Fracture dislocations of the carpo-metacarpal joints are high energy injuries which may occur with or without fracture. Carpo-metacarpal fracture dislocations of the hand are uncommon injuries accounting for less than 1% of hand injuries.

**Case report:** We report a 55 year old man presented who to the emergency room, with history of self-fall following which his left hand was run over by a bullock cart. Clinical examination of his hand revealed an abrasion 3x4 cm over the dorsum of his third metacarpal. There was diffuse swelling and tenderness over the dorsum of his hand. Radiographs showed that there was radial and volar dislocations of the second, third and fourth carpo-metacarpal joints with fracture of the trapezium, trapezoid and and chip fracture of the proximal phalynx of the thumb. Computerised topography of the hand revealed that there was also chip fracture of the hamate, chip fracture of the base of the fifth metacarpal in addition to the above mentioned injuries. The patient was surgically managed by open reduction and K-wire fixation.

**Conclusion:** Volar carpo-metacarpal joint dislocations are unique in their presentation. They are serious injuries and need to be reduced at the earliest. The articulation of third metacarpal and capitate is more proximal than the carpal articulations of other CMC joints. This produces a keystone relationship with other CMC joints. When these injuries are detected early, closed reduction can be easily performed. If reduction fails, surgical reduction is mandatory. The disability of the hand is more severe if treatment is delayed.

**Keywords:** Complex injury of hand; Volar carpo-metacarpal dislocation; Rare injury

### Introduction

Fracture dislocations of the carpometacarpal (CMC) joints are high energy injuries which may occur with or without fracture. Carpo-metacarpal fracture dislocations of the hand are uncommon injuries accounting for less than 1% of hand injuries [1]. These injuries are often overlooked or missed. Diagnosis of this rare injury requires an accurate clinical examination and radiographs. Dorsal dislocations are more common due to stronger static (dorsal ligaments) and dynamic (wrist extensors) restraints that cause the failure of bone dorsally, with subsequent rupture of the volar ligaments [2-4]. The stability of the carpo-metacarpal joint is by four ligaments namely the palmar metacarpal, dorsal metacarpal and two sets of interosseous ligaments. The index metacarpal has a predominantly stable configuration because of its wedge-shaped articulation with the trapezoid [3]. The diagnosis may be missed initially due to diffuse swelling and association of other life threatening injuries. They are associated with high risk of compartment syndrome. Although closed reduction is possible, better results are seen in open reduction and internal fixation with K-wires. This will help in accurate reduction and early functional recovery [1].

### Case Report

A 55 year old man, presented to the emergency room with pain and diffuse swelling over the dorsum of his left hand. He presented to the ER with history of self fall following which his hand was run over by a bullock cart. His hand was intially splinted and airway, breathing and circulation secured. There was no history of loss of consciousness or evidence of chest or abdominal trauma which were confirmed radiographically. Clinical examination of his hand revealed an abrasion 3 x 4 cm over the dorsum of his third metacarpal. There was diffuse swelling and tenderness over the dorsum of his hand. Peripheral vascularity was intact confirmed by capillary refill and pulsoxymeter.

Radiographs of the hand in anteroposterior, oblique and true lateral views showed that there was radial and volar dislocations of the second, third and fourth carpo-metacarpal joints with fracture of the trapezium, trapezoid and and chip fracture of the proximal phalynx of the thumb. Computerized topography of the hand revealed that there was also chip fracture of the hamate, chip fracture of the base of the fifth metacarpal in addition to the above mentioned injuries (Figure 1). Patient was taken to the operating theatre and closed reduction attempted under supra-clavicular combined with axillary block. Closed reduction failed following which a decision to open the joint was made.

### Surgical Procedure

A 3 cm longitudinal incision was made between the second and the third metacarpals. Subcutaneous fascia slowly dissected. Interossei were then reflected at the carpo-metacarpal joint to expose the dislocated joint. Using a bone lever and continuous traction the third carpometacarpal joint was pulled up dorsally and reduced. This was the keystone of all the carpo-metacarpal joints. Once this was reduced the second and the fourth carpo-metacarpal joints fell into place. Two K wires were introduced from the base of the third metacarpal into the capitate and hamate respectively. Another k wire was introduced from the base of the second metacarpal into the capitate. One more k wire

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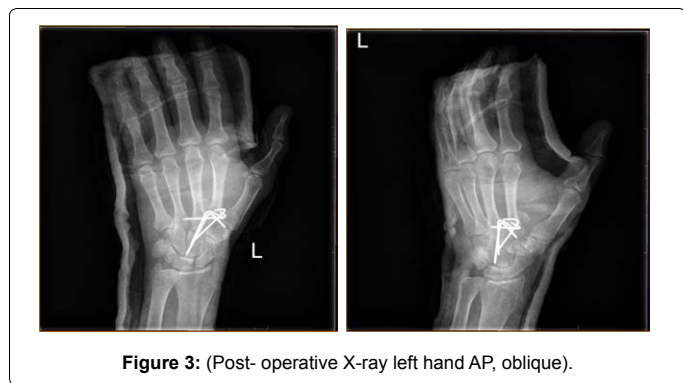
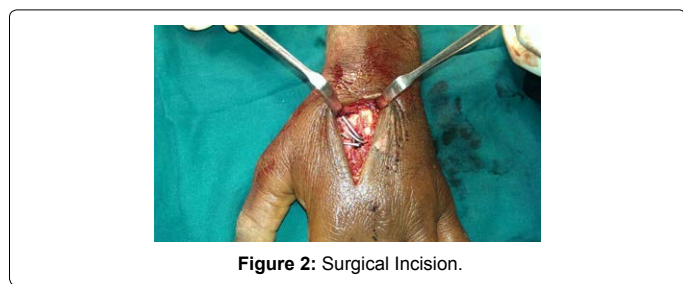
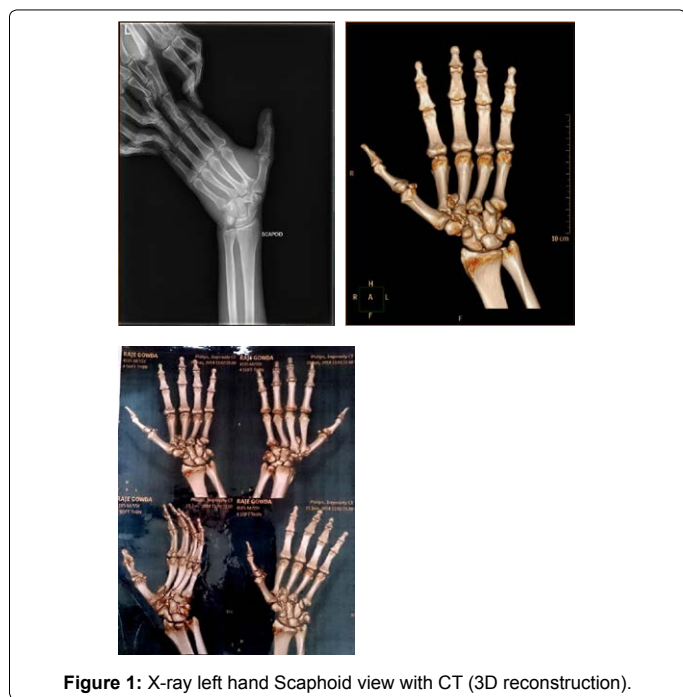
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was introduced horizontally across the base of second, third and fourth metacarpal bases (Figures 2 and 3). A thorough wash was given and surgical wound closed. A volar below elbow slab was applied.

Post operatively patient was symptom free. Antibiotics and suture removal was done on the tenth post-operative day. Plaster and Kirschner wires were removed at six weeks. Active fingers movements were encouraged from post-operative day one. Our patient regained full range of movement of wrist and 90% of fingers movements at three months and achieved 75% hand grip by three months. He had no functional disability at three months follow-up (Figures 4 and 5).



### Discussion

Multiple dislocations of CMC joints (excluding thumb) are uncommon injuries [1]. Although dislocations of CMC joints of fourth and fifth fingers are well recognized, those of second and third fingers are infrequent. Most of these cases, cited in the world literature are dorsal in direction [5]. Volar dislocation of these joints particularly the second and third fingers have been reported rarely [1,2,6]. CMC joint has a complex anatomical configuration. The bases of the metacarpals articulate with each other and the distal row of carpal bones in an interlocking fashion. Strong dorsal, volar and interosseous ligaments help in further support of these joints. The articulation of third metacarpal and capitate is more proximal than the carpal articulations of other CMC joints. This produces a keystone relationship with other CMC joints. This is the reason for higher incidence of dislocation of third and fourth CMC joints. As the first CMC joint is a double saddle joint surrounded by four ligaments, injury here more likely results in Bennets fracture dislocation rather than a pure dislocation. Fracture-dislocations of CMC joints is often not recognized early due to swelling. Henderson et al. reviewed 21 patients who suffered CMC dislocations and found that diagnosis was missed in 15 cases when they first

presented to the emergency room [7]. Although loss of parallel joint surfaces at the CMC joint articulations on postero-anterior radiographs is indication of this injury, a true lateral radiograph is needed for accurate diagnosis [7]. When these injuries are detected early, closed reduction can be easily performed. If reduction fails, surgical reduction is mandatory. Stabilization of these joints is mandatory by Kirschner wires or screws to prevent redislocation. The key to reducing these dislocations is to attempt reduction of the third CMC joint which is the keystone. Once this joint is reduced, the other CMC joints will fall into place.

## Conclusion

Volar carpo-metacarpal joint dislocations are unique in their presentation. They are serious injuries and need to be reduced at the earliest. The articulation of third metacarpal and capitate is more proximal than the carpal articulations of other CMC joints. This produces a keystone relationship with other CMC joints. When these injuries are detected early, closed reduction can be easily performed. If reduction fails, surgical reduction is mandatory. The disability of the hand is more severe if treatment is delayed

## Clinical Message

Volar carpo-metacarpal joints are serious injuries. They are unique

in their presentation and should be managed at the earliest to minimize disability.

## Conflict of Interest: None

**Ethical standards:** The patient provider his/her consent to the publication of this report.

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