

Post Traumatic Dorso-Ulnar Hamato-Fifth Metacarpal Dislocation: A Case SeriesAddis^{1*}, Gulrukh H.²¹Assistant Professor, Department of Orthopaedics, Sikkim Manipal Institute of Medical Sciences, Gangtok, Sikkim, India²Associate Professor, Department of Community Medicine, Vinayaka Missions Medical College, Karaikal, Puducherry UT, India

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Corresponding author: Dr. Addis

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Abstract:

Pure hamato-fifth metacarpal dislocation is an uncommon injury. Direct trauma to the hand is the leading cause of dislocation of the hamato-fifth metacarpal joint. It causes significant weakness of 'grip'. Orthopaedic trauma specialists must have a high index of suspicion of this injury while examining patients presenting with trauma around the carpometacarpal region. This should be supplemented with appropriate radiological investigations. Treatment should be individualized based on reduction and stability of the fifth carpometacarpal joint. Stability of the fifth carpometacarpal joint ensures adequate support and strength while gripping objects. If inadequately treated this injury can produce arthritis of the carpometacarpal joint in the long run. In the case series reported here, we highlight the need for proper clinical examination and appropriate radiographs for diagnosing the isolated fifth carpometacarpal joint dislocation as it can be easily missed on initial presentation. This case series also highlights different approaches for treatment of this dislocation depending on the maintenance of reducibility.

Keywords: K-wire, Closed Reduction, Trauma, Injury, Grip Strength.

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Introduction

The incidence carpometacarpal (CMC) joint dislocation is estimated to be less than 1.5% of hand trauma injuries [1]. The dislocation generally occurs due to high energy trauma [2]. It may be accompanied with or without fracture. These dislocations can be easily missed due to unclear presentation, subtle radiological finding or in presence of other injuries [3] thus, warranting a high index of suspicion by the treating orthopaedician.

The fifth carpometacarpal (CMC) joint is an articulation between the base of fifth metacarpal (MC) and carpal hamate bone. It is a modified compound type saddle joint [4]. This joint is stabilized by bony congruencies, musculotendinous attachments, dorsal and volar interosseous ligaments and joint capsule [5].

Gliding motion up to thirty degrees occurs at this joint. This movement is crucial while gripping objects. Dislocations of the fifth CMC joint can produce a functionally weaker 'grip' which can cause hindrance to performing activities of daily living. Even delay in diagnosis of CMC joint dislocation can cause increase in the incidence of CMC joint arthritis [6]. Hence treating this injury

expeditiously becomes very important. The following three cases will highlight the different methods of presentation and management of dislocations of the fifth CMC joint.

Case 1: A sixteen-year-old adolescent male sustained a motor vehicle accident with direct impact to his dominant right hand. He arrived at our emergency department about half an hour later and was clinically assessed for any life-threatening injuries.

The patient had pain and swelling over the dorsum of his right hand. He had a full range of hand and finger movements. There were no distal neurovascular deficits. Antero-posterior (AP) and lateral x-rays of the injured hand were taken and he was initially diagnosed as having a sprain of his right hand by the junior casualty medical officer. A compression crepe bandage was applied and he was discharged on oral analgesics. The patient returned to the orthopaedic outpatient department (OPD) the next day with complaints of severe pain and difficulty in holding objects. Clinical examination revealed tenderness and crepitus over base of fifth metacarpal with an abnormal prominence. X-rays were repeated in Oblique views which showed

isolated fifth carpometacarpal (CMC) joint dislocation (Figure 1).



Figure 1: oblique X-ray view of the hand showing fifth carpometacarpal joint dislocation

Closed reduction (CR) was attempted in the OPD with longitudinal traction and direct pressure over the fifth metacarpal base. Reduction was attained. However, on releasing the pressure, the joint was re-dislocating. As the joint was unstable the need for surgical stabilization and fixation was explained to the patient and guardian, and they consented to the same. Patient was admitted. After anaesthetist evaluation patient underwent CR and percutaneous Kirschner wire fixation of the right fifth CMC joint. The procedure was performed under brachial block and C-arm guidance. The fixation was protected in a below elbow slab for four weeks. At four weeks post-op, the slab was removed, physiotherapy was started and a removable splint was given. At six weeks post-op, the Kirschner wires were removed. X-rays of the hand were taken to confirm maintenance of reduction following Kirschner wire removal, and physiotherapy was continued. At eight weeks post-op, the removable splint was discontinued. Patient's grip strength was assessed by sphygmomanometer technique at

twelve weeks and was found to be similar to the unaffected hand [7].

Case 2: A twenty-four-year-old male sustained a motor vehicle accident with direct injury to his left hand. He was given first aid at a nearby Government Primary Health Centre and arrived at our OPD about two hours after the accident. He complained of pain and swelling over the dorsum of his left wrist and hand. On clinical examination, tenderness was noted at the base of fifth metacarpal.

Distal vascularity and neurology were normal. AP and oblique x-rays of the affected hand confirmed the diagnosis of pure fifth CMC joint dislocation. Immediate CR was performed with longitudinal traction and direct pressure over fifth metacarpal base. Reduction of the joint was attained and was found to be stable on releasing the pressure. Confirmatory x-rays showing the reduced fifth CMC joint were taken and a well moulded below elbow slab was applied (Figure 2).



Figure 2: application of a well moulded below elbow slab after reduction of the dislocation

The slab was converted to a cast at the end of one week once the oedema had subsided. Check x-rays were taken every fortnight to confirm maintenance of reduction. The cast was removed at four weeks and physiotherapy was started. The patient was

advised to use a removable splint for another two weeks. At ten weeks, patient's grip strength was assessed by sphygmomanometer technique and was found to be comparable to the unaffected side[7].

Case 3: A twenty-seven-year-old male was brought into our emergency department in an unconscious state by his relatives. It was presumed that he had fallen off a coconut tree while trying to pluck coconuts. His vitals were stable. On clinical examination there was a laceration on his head over the right parietal region and an obvious deformity of his left leg indicating a closed fracture of his left tibia and fibula. Computer Tomography (CT) of his brain revealed a Sub Dural Haemorrhage (SDH) in his right parietal region. X-rays of his left leg confirmed a comminuted middle third diaphyseal fracture of left tibia and fibula. His deformed left leg was realigned and supported in an above knee Plaster of Paris (POP) slab. His laceration was sutured and he was admitted to the neurosurgical intensive care unit (ICU) for further monitoring.

On the fifth day, orthopaedic review was sought for the fractured left leg as patient had regained consciousness and his condition had improved. The SDH had cleared and patient was considered fit to undergo any surgery that was planned for him. During the review patient confirmed that he had

indeed slipped and fallen off a coconut tree. He was willing to undergo surgical fixation of his fractured left leg. However, he complained that he was having pain in his right hand and was finding it difficult to hold a spoon or glass of water. Clinical examination revealed a loss of grip strength in his right hand. Tenderness was noted at the base of his right fifth metacarpal. AP and Oblique x-rays of the right hand were ordered, which showed an isolated fifth CMC joint dislocation that was missed during the initial evaluation.

It was decided to address both the injuries during the same surgical sitting. Appropriate consents were taken for both the surgical procedures. Pre anaesthetic check and approval was taken and patient was operated on the eighth day of admission. CR and interlocking intramedullary nailing was performed for the left tibia.

The fifth CMC joint was transfixed with Kirschner wires that were passed percutaneously following CR, as the joint was unstable (Figure 3). Both the procedures were performed under C-arm guidance. His hand was protected in a below elbow slab.

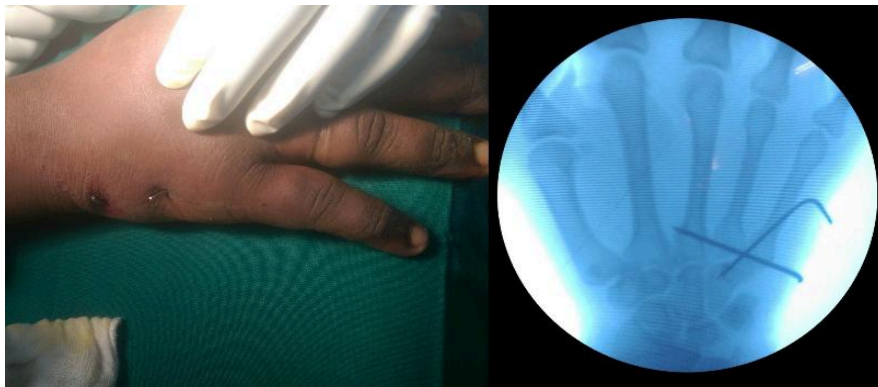


Figure 3: intraoperative image of percutaneous Kirschner wire fixation

Postoperatively after six weeks both the slab and Kirschner wires were removed. X-rays of the hand showed a reduced fifth CMC joint. Hand Physiotherapy with the aim to regain grip strength was started for the patient. Meanwhile patient's leg fracture was starting to show signs of union. By tenth week patient had regained good grip strength measured using the sphygmomanometer technique [7]. He was allowed to start partial weight bearing on his left leg and ambulate using crutches. His left leg fracture went on to unite by sixteen weeks at which time the crutches were discontinued.

Discussion

Pure Carpometacarpal (CMC) joint dislocations are very rare hand injuries accounting for approximately 1 % of all hand injuries [4]. As the fifth CMC joint has a saddle shape and loose ligamentous attachments it has greater mobility compared to other CMC joints [8]. This

arrangement although essential for CMC joint mobility, makes the fifth CMC joint more prone to dislocation. The dislocation occurs either in volar or dorsal direction. As the musculotendinous structures on volar side provide more stability to the palmar side, dorsal dislocations are more common [9]. All of our patients had sustained a dorsal fifth CMC joint dislocation.

Most of these injuries occur due to high energy trauma like motor vehicular accidents and falls from height [10]. The mechanism of injury in these cases maybe direct force in axial direction which in turn leads to flexion or extension forces. Two patients in this case series sustained dislocation following motor vehicle accident while one patient fell from a height.

The diagnosis of isolated fifth CMC joint dislocation can be easily missed. In a case series done by Henderson and Afra, 15 out of 21 cases of

CMC dislocation were missed on initial examination [11]. The reasons for this are multifactorial; lack of knowledge, lack of clinical experience, improper/incomplete clinical examination [3]. In the first case of the series, the diagnosis was missed as there had been no obvious deformity appreciated in AP or lateral view radiographs. However, pain and weak grip raised the suspicion of fifth CMC dislocation and oblique view radiographs were ordered. Similarly in the third case the diagnosis of fifth CMC dislocation was delayed as the patient was unconscious and wasn't having any obvious deformity of hand and wrist.

Another reason for delayed or missed diagnosis can be inappropriate radiographic view. As reported in the first case of the series, the dislocation was missed in AP and lateral view radiographs. There have been conflicting evidence regarding the type of radiographic view required for diagnosing a CMC joint dislocation. In the case series done by Siddique et al, lateral view revealed the dorsal dislocation of CMC joint, whereas the study done by Kural et al reported oblique view to be the best method for evaluation [6,12,13]. In our cases, all the dislocation was clearly demarcated in oblique X-ray view.

In all our patients, we noticed a decrease in grip strength following injury. This along with pain and swelling were the primary symptoms of the patients in this series. The motor branch of ulnar nerve lies in front of the fifth CMC joint and is at risk of injury. None of the patients in this series had any neurological or vascular complications pre or post operatively.

Performing a closed reduction is visually straight forward but maintenance of reduction is not easy and hence warrants some form of internal fixation [14]. In this series two patients required trans fixation of fifth CMC joint following reduction due to instability while one patient had a stable fifth CMC joint post reduction and hence was treated in a cast. The methods of internal fixation commonly advocated by Arbeitsgemeinschaft für Osteosynthesefragen (AO) are percutaneous or open K-wiring and lag screw fixation [4]. In our patients, we employed the technique of using two Kirschner wires; one wire transfixed the fifth CMC joint while the second wire transfixed the fifth, fourth and third metacarpal bases [15].

A structured physiotherapy program was employed in all our patients. It consisted of early initiation of active and passive hand and finger movement exercises. Once patients attained full range of wrist and finger movements which usually took about two weeks, they were taught exercises which helped them regain their grip strength. By three

months patients had regained grip strength similar to their unaffected hand.

Conclusion

Fifth CMC joint dislocations are rare injuries. These injuries are quite frequently missed. A high index of suspicion along with keen observation and examination are key to diagnosing these injuries. As fifth CMC joint dislocations can produce a functionally weaker 'grip' their treatment should be individualized based on the stability of the joint post reduction.

Ethical Issues: Informed written consent for treatment and publication of the cases and images were obtained from the patients.

Author's Contribution: In the above study, the cases were identified and treated by A. Writing, revision and submission was done by GH. The final revised manuscript was accepted by both the authors.

References

1. Green DP. Green's Operative Surgery of the Hand. 5th ed. Elsevier; 2007.
2. Steinmetz G, Corning E, Hulse T, Fitzgerald C, Holy F, Boydston S, Lehman T. Carpometacarpal Fracture-Dislocations: A Retrospective Review of Injury Characteristics and Radiographic Outcomes. Hand (N Y). 2021 May; 16(3):362-367.
3. Gaheer RS, Ferdinand RD: Fracture dislocation of carpometacarpal joints: a missed injury. Orthopedics. 2011, 34:114-6.
4. Md, R. B. W., Bucholz, R. W., Heckman, J. D., Court-Brown, C. M., Tornetta, P., & Kasser ;, J. B. J. H. R. (2011). Rockwood & Green's Fractures in Adults (Fractures (Rockwood) (2 Vol. Set)) (7th ed.). Lippincott Williams & Wilkins
5. Tingart M, Balthis H, Bouillon B, Tiling T. Die dorsale karpometakarpale Luxation des 5. Strahls. Diskussion der Diagnostik und Therapie an 2 Fällen [Dorsal carpometacarpal dislocation of the fifth finger: discussion of diagnosis and therapy on two cases]. Unfallchirurg. 2000 Jan; 103(1):76-80. German.
6. Kural et al. Fourth and fifth carpometacarpal fracture-dislocations. Acta Orthop Traumatol Turc 2014;48(6):655-660.
7. Hamilton GF, McDonald C, Chenier TC. Measurement of grip strength: validity and reliability of the sphygmomanometer and jamar grip dynamometer. J Orthop Sports Phys Ther. 1992; 16(5):215-9.
8. Mito K, Nakamura T, Sato K, Toyama Y, Ikegami H. Dorsal dislocations of the second to fifth carpometacarpal joints: a case report. Hand Surg. 2008; 13:129-32

9. Canale ST. Campbell's Operative Orthopaedics. 10th ed. Mosby; 2003
10. Elghoul N, Jalal Y, Bouya A, Zine A, Jaafar A. Pure Isolated Dorsal Hamatometacarpal Dislocation in a Rider: A Case Report and Review of Literature. J Orthop Case Rep. 2018 Sep-Oct;8(5):29-31.
11. Henderson JJ, Arafa MA. Carpometacarpal dislocation. An easily missed diagnosis. J Bone Joint Surg Br 1987;69:212-4
12. Yasir Salam Siddiqui et al., Multiple Carpometacarpal Fracture. Journal of Clinical and Diagnostic Research. 2011 June, Vol-5(3): 618-620
13. Johnson J, Fowler J, Costello J, Ruppert K, Kaufmann R. Optimal Oblique Radiographs to Identify Fifth Carpometacarpal Dorsal Subluxations: A Cadaveric Study. J Hand Surg Am. 2018 Dec; 43(12): 1139.e1-1139.e5.
14. Anjum R, Roy A, Farooque K, Sharma V. An Isolated Pure Dislocation of Fifth Carpometacarpal Joint: Case Report and Review of Literature. J Orthop Case Rep. 2017 Mar-Apr; 7(2):14-16.
15. Mozaffarian K, Vosoughi AR, Hedjazi A, Zarenezhad M, Nazmi MK. The safest direction of percutaneous pinning for achieving firm fixing of the fifth carpometacarpal joint. J Orthop Sci. 2012 Nov; 17(6):757-62.