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**Dr. Kalaivanan Kannian**  
Consultant Orthopaedic Surgeon,  
Asian Joint Reconstruction,  
Institute, AJRI, SIMS Hospital,  
Chennai, Tamil Nadu, India

**Dr. Karthi Sundar Vellaiputhiyavan**  
Consultant Orthopaedic Surgeon,  
Apollo Hospital, Chennai, Tamil  
Nadu, India

**Dr. Aditya C Pathak**  
Consultant Orthopaedic Surgeon,  
Aditi Hospital, Mulund,  
Mumbai, Maharashtra, India

## Complex multiple Metacarpo phalangeal joint dislocation. Is closed reduction, a good treatment option?

**Dr. Kalaivanan Kannian, Dr. Karthi Sundar Vellaiputhiyavan and Dr. Aditya C Pathak**

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### Abstract

**Introduction:** Multiple Metacarpophalangeal (MCP) joint dislocations are relatively rare in comparison with the single Metacarpophalangeal joint dislocation in either plane with limited literature evidence.

**Case Report:** Hereby, we present a case of 40 year old male who presented with Kaplan's dimple sign and "double Z deformity" of his left hand following a fall onto his out stretched hand. Radiological investigation revealed Multiple MCP joint dislocations involving his left index and middle finger. The 2<sup>nd</sup> MCPJ dislocation was simple closed one while the 3<sup>rd</sup> MCPJ dislocation was compound open type. The complex multiple MCPJ dislocation was treated successfully with closed reduction under wrist block. The patient is in regular follow-up with no recurrence and good hand function at the end of one year.

**Conclusion:** Complex multiple MCP joint dislocation can be treated successfully with closed reduction using proper reduction technique.

**Keywords:** Multiple metacarpophalangeal joint dislocation, Kaplan dislocation, dimple sign, double Z deformity, closed reduction

### Introduction

Metacarpo-phalangeal joint dislocations are not common and multiple metacarpal-phalangeal joint dislocations are much rarer. Index finger is most commonly involved and dislocation is generally dorsal. Patients present with the injured MCP joint held in extension with mild reciprocal flexion at the interphalangeal joints [1]. Substantial amount of force is usually required to disrupt the joints [2]. Here we present a very rare injury of hand with multiple Metacarpo-phalangeal joint dislocation involving index and middle fingers treated successfully with closed reduction.

**Case report:** A 40 yr old male, laborer by occupation presented to our emergency department following a fall from height of 3-4 meters with outstretched hand. Patient fell on hard ground with hyperextension at Metacarpo-phalangeal joint. He complained of severe pain, swelling, deformity with loss of movement of his left hand. Clinical examination revealed a "double Z deformity" with loss of bony prominence over his left index and middle finger knuckle, Kaplan's dimple sign [2] over the volar aspect of the extended second MCP joint of his left hand, a wound over the third Metacarpo-phalangeal joint with head of 3<sup>rd</sup> metacarpal exposed long with FDS [Fig. 1, 2, 3, 4] Patient had sustained a contaminated open wound of 2cm by 1cm on volar aspect through which the third metacarpal head was exposed. Though patients long flexor tendons were exposed through the wound but fortunately there were no tendon injuries and neurovascular status hand and fingers was intact. Radiological investigation revealed dorsal dislocation of MCP joints involving his left index and middle finger [Fig.5 & Fig.6]. Under wrist block the wound was thoroughly debrided and wound lavage was given. Wound was sutured with simple tag sutures once joint was reduced. A successful stable closed reduction was done [Fig.7 & Fig.8] as described in reduction technique. The suturing of the wound over volar aspect was done after confirming the integrity and continuity of FDS over the middle finger. Immobilization was done briefly with an extension block POP for two weeks followed by early hand rehabilitation.

### Correspondence

**Dr. Kalaivanan Kannian**  
Consultant Orthopaedic Surgeon,  
Asian Joint Reconstruction,  
Institute, AJRI, SIMS Hospital,  
Chennai, Tamil Nadu, India

The patient didn't had any recurrence of dislocation and good Michigan score of above 90 percent at end of one year.



**Fig 1:** Dimple sign over 2nd MCP joint, exposed 3rd MC Head of left hand



**Fig 2:** Dimple sign over 2nd MCP joint, exposed 3rd MC Head of left hand



**Fig 3:** "Double Z deformity" of left hand



**Fig 4:** "Double Z deformity", an illustration



**Fig 5:** X-ray AP view showing dorsal dislocation of MCPJ – left hand



**Fig 6:** X-ray lat view showing dorsal dislocation of MCPJ – left hand



**Fig 7:** immediate post-op AP xray showing successful closed reduction – left hand



**Fig 8:** immediate post-op oblique xray showing successful closed reduction – left hand

### Reduction Technique

No proper reduction technique has been labeled gold standard yet so far in the literature. Here in our case we followed a reduction technique with wrist in flexion relaxing the intrinsic and extrinsic flexors followed by a direct pressure over the head of metacarpal dorsally and phalangeal base volar wards and then with increased flexion at the MCP joints. One has to avoid longitudinal traction and hyperextension during closed reduction, may pull volar plate into joint. Post reduction the Z-deformity and Dimple sign both disappear and there is full passive movement at MCP joint. Further with minimal hyperextension it does not dislocate.

### Discussion

Metacarpo-phalangeal joint is a very stable joint <sup>[1]</sup> The following anatomical factors, MCPJ being a condyloid joint with metacarpal head being narrow dorsally and broad in volar aspect and thus increasing the contact area with the base of the proximal phalanx as the joint is flexed. The capsule of the MCPJ is thick along the sides extending from the neck of the metacarpal to the base of the proximal phalanx. Dorsally, the loose insertion of the common extensor tendon. The volar plate along with intervolar ligaments in the volar aspect. Laterally MCPJ are reinforced with collateral ligaments, which are more taut in flexion than extension. Sagittally bands of the palmar fascia and tendons of the intrinsic musculature of the hand reinforce MCPJ. Thus the MCPJ joint is more stable laterally in full flexion but allows abduction and adduction in extension <sup>[1, 2]</sup>.

In 1957 Kaplan described the Dorsal Dislocation of metacarpophalangeal joint and named it as Kaplan's lesion <sup>[2]</sup>. Kaplan also pointed out the three obstacles in the reduction of the dislocated MCP joint, namely (a) Wedging of the volar plate within the joint, (b) Trapping of the metacarpal head by the palmar fascia and transverse metacarpal ligament, (c) The displaced flexor tendons which are dorsal to the metacarpal head <sup>[2, 3]</sup> The MCP joints generally dislocate in a dorsal direction and very rarely volarly, with the index finger most commonly affected followed by little finger. The usual mechanism of injury to an MCP joint is a fall on the outstretched hand causing forcible hyperextension of the joint. Patients present with the injured MCP joint held in extension with mild reciprocal flexion at the interphalangeal joints. A great deal of force is usually necessary to disrupt the joints, and most dislocations are accompanied by avulsion fractures of the involved bones. Dislocation without fractures rare, and it most often involves the carpometacarpal joint of the little finger <sup>[4]</sup>.

MCP joint dislocations which are not reducible by closed means are labelled as Complex MCP joint dislocation and those reducible are called as simple. Puckering of the palmar skin overlying the metacarpal head is pathognomonic of the same and so called "the dimple sign of Kaplan" <sup>[2, 5]</sup>. Multiple Kaplan-Multiple Metacarpo-phalangeal joint dislocation is very rare. Our case study was comparable to case study by Stowell *et al.* as it had similar Metacarpophalangeal dislocation, one being open and other two being closed treated at the earliest in emergency department by closed reduction and achieving good results <sup>[6]</sup>. Rath *et al.* had described Open dislocations of the metacarpophalangeal (MP) joints of index, middle and ring finger treated successfully by closed reduction and debridement <sup>[7]</sup>.

The volar and dorsal approaches are viable options in the treatment of complex MP joint dislocations of the fingers. The dorsal approach may offer the critical advantage of decreased

risk of neurovascular injury, as well as the ability to manage associated osteochondral fractures. A potential disadvantage of dorsal open reduction is the need to split the volar plate to reduce the metacarpal head. Complex metacarpophalangeal (MP) joint dislocations were classically described by Kaplan <sup>[1]</sup> to involve rupture of the volar plate from its weaker proximal attachment to the metacarpal. The volar plate becomes entrapped between the metacarpal head and base of the proximal phalanx by its attachment to the deep transverse metacarpal ligament, thus becoming the primary impediment to reduction <sup>[2-6]</sup> The flexor tendons, pretendinous band of the palmar fascia ulnarly, and lumbrical muscles radially may form a noose around the dislocated MP joint, further inhibiting closed reduction. Initial attempts at reduction using traction will further tighten this envelope, possibly interposing additional structures. This underscores the need for clinical and radiographic recognition of this injury pattern. The radial digital nerve of the index finger is under tension and often assumes a precarious position between the metacarpal head and the skin, making it susceptible to injury during the volar approach <sup>[7-8]</sup>.

The dorsal approach is the gold standard approach with no danger to neurovascular structures, adjacent structures and aids fixation of associated articular chip fractures <sup>[9]</sup>. Mattew was successful in reducing a MCP dislocation with flexion at wrist and interphalangeal joints to reduce tension on the flexor tendons during relocation. The dislocated MCP joint then hyperextended to 90 degrees followed with traction along the axis of the proximal phalanx. The base of the proximal phalanx is reduced over the head of the metacarpal using volar pressure. The MCP joint was then flexed to complete the reduction <sup>[10]</sup>. Thus Complex multiple MCP joint dislocation can be treated successfully with proper closed reduction technique and it yields good functional results.

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