

Open Multiple Volar Fractures-dislocations of the Metacarpophalangeal Joints: Case Report and Review of Literature

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Authors' contributions

This work was carried out in collaboration among all authors. Author MOC designed the case report and wrote the first draft of the manuscript. Authors AG and YH corrected the first draft and managed the literature searches. Authors RBA and WB managed the review of literature. Authors AK and MAS corrected the final manuscript. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Open multiple volar fractures-dislocations of metacarpophalangeal (MCP) joints are exceptional and rarely reported in literature. The presumed mechanism is forced hyperextension of MCP joint, associated with active flexion. It is a functional emergency of the hand that requires reduction and stabilization. An early and well conducted rehabilitation program allows controlling edema and avoiding stiffness of the MCP joints.

Through this paper we report the case of a 53-year-old right-handed man with open multiple volar fractures-dislocations of three long fingers. We aim to highlight the importance of an early debridement with a good reduction and stabilization of the fracture-dislocation, followed by a well conducted rehabilitation program which are the only guarantor of a good functional recovery.

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1. INTRODUCTION

Multiple simultaneous dislocations of the metacarpophalangeal joints are exceedingly rare [1]. Fracture of the metacarpal head can be associated to MCP joint dislocation due to shearing forces on articular surfaces or avulsion injuries at ligament attachments [2]. The MCP joints rarely dislocate in a volar direction [3]. Open multiple volar fractures-dislocations of the MCP joints of long fingers occur in high-energy trauma. They represent challenging injuries and are rarely reported in literature. The surgeon must choose an appropriate treatment based on fracture reduction and joint stabilization. Poorly managed, they can compromise the palmo-digital hold and consequently the function of the hand. Rehabilitation is a crucial time of care.

Through this paper we report the case of an open multiple volar fracture-dislocation of 2nd, 3rd and 4th MCP joints of the left hand in order to analyze the epidemiological, clinical and therapeutic data of these exceptional lesions. A literature review will be presented.

2. CASE REPORT

A 53-year-old man, right-handed, maneuvering, with no notable pathological history, presented to our emergency after a disc-grinder domestic accident resulting in an open trauma of the dorsal side of his left hand.

Clinical examination shows a 5 cms linear wound at the dorsal side of the 2nd, 3rd, and 4th MCP

joints, a dinner fork deformity with a total functional impotence of the long fingers (Fig. 1).



Fig. 1. Preoperative photo showing the open fracture-dislocation of the 2nd, 3rd and 4th MCP joints

X-Ray shows a volar fracture-dislocation of the 2nd, 3rd and 4th MCP joints (Fig. 2a, 2b).

The exploration after debridement in the operating room found a section of the extensor system of the 2nd, 3rd and 4th fingers in the 5th zone and a wide articular opening with palmar fractures- dislocations of their respective MCP joints. We realized a reduction of the fracture of the M2 cervix through a dorsal approach, as the wound was dorsal, and stabilized it by axial pinning. MCP joints of the 3rd and 4th fingers were reduced and stabilized by oblique pinning. The volar plates of the 3 MCP joints were removed in order to facilitate the reduction. Radiological control at the end of intervention was satisfying (Fig. 3a, 3b).

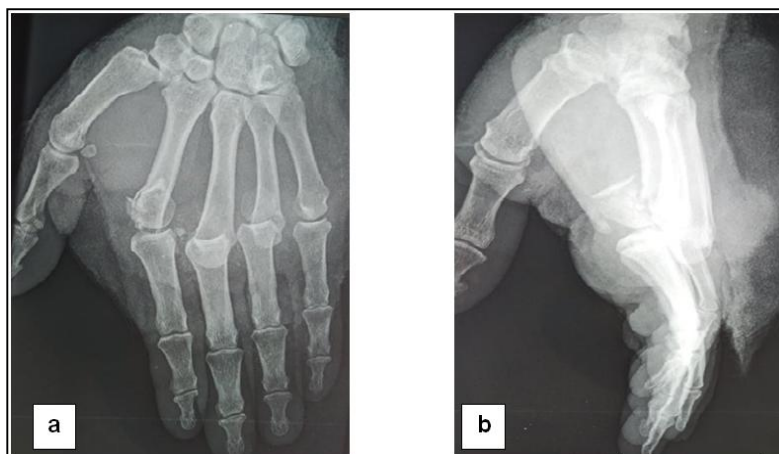


Fig. 2. X-ray of the left hand of face (a) and of profile (b) showing the multiple volar fractures-dislocations of the MCP joints of the first 3 long fingers

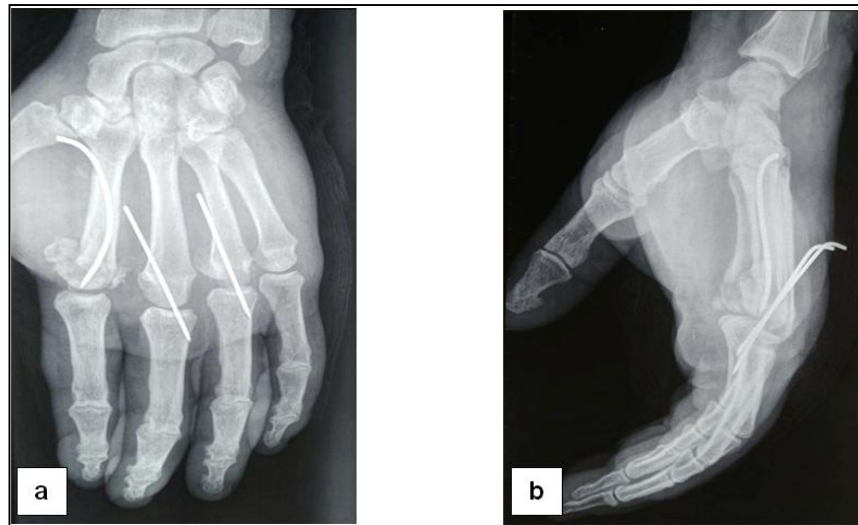


Fig. 3. X-rays of the left hand of face (a) and of profile (b) after reduction and stabilization

A repair of the extensor system and a complete skin closure were performed (Fig. 4) with an immobilization using syndactyly and an MP STOP splint for 3 weeks. Rehabilitation was started at the third week post-operative, after removal of the pins, and continued for 02 months. It consisted of passive and active range of motion exercises of the wrist and fingers, divided into three sessions per week. Additional exercises of muscular strengthening and occupational therapy allowed regaining a complete hand function.

Our patient was seen at 03 months post-operative and the result was marked by a functional recovery of the hand with a full range of motion of the three affected MCP joints; good palmo-digital grip with a Total Active Motion (TAM) equal to 250°, and an almost complete extension of the long fingers with an overall extension deficit equal to 5° (Fig. 5a, 5b and 5c). Radiological bone consolidation was also

obtained (Fig. 6a and 6b). The resumption of work was made after 90 days.



Fig. 4. Post-operative photo

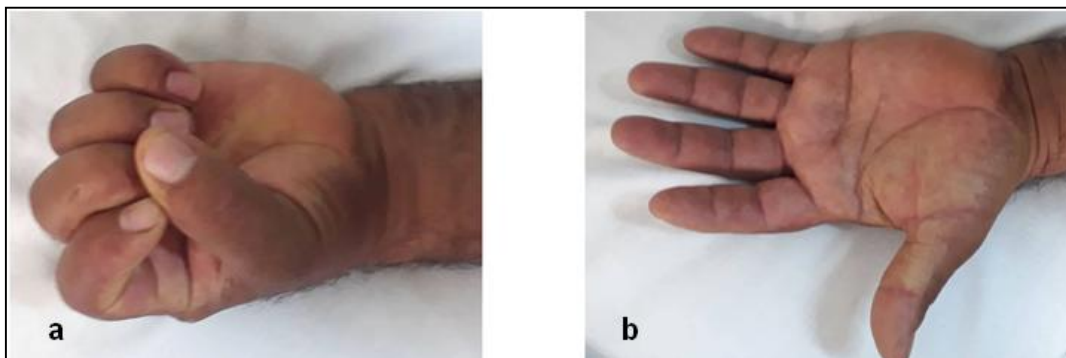




Fig. 5. Functional result at 03 months post-operative: (a) Complete winding of long fingers (b) and (c): Full extension of long fingers

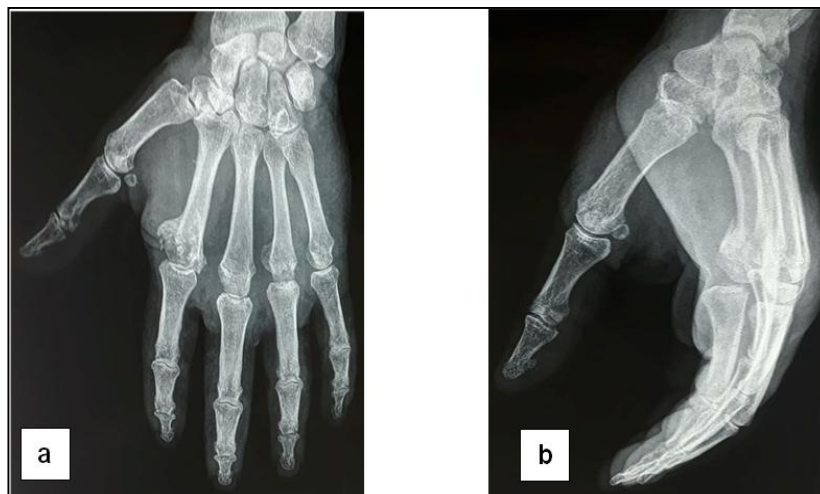


Fig. 6. X-ray result at 03 months post-operative: X-rays of the left hand of face (a) and of profile (b)

3. DISCUSSION

Irreducible dislocations of the MCP joint were first described by Malgaigne in 1855 [2]. The pathologic anatomy was well appreciated for the first time in 1957 by Kaplan and described as buttonholing of the metacarpal head through the volar plate and into palmar structures; between the lumbrical radially and the flexor tendons ulnarly [2,3]. They are relatively uncommon and sometimes called “complex” because a structure such as volar plate or a ligament is caught between the articular surfaces [4].

Concomitant intra-articular fracture fragments produced by shearing forces on the articular surfaces or avulsion injuries at ligament attachments have been described by several authors [2,5].

Since its description by Kaplan, several small series of dorsal MCP joint dislocations have been reported. Cases of volar MCP joint dislocations

are exceedingly rare and have been noted only in passing without detailed description in the literature [6].

The mechanism of volar dislocation has been controversial. Renshaw and Louis proposed as a mechanism a forced hyperextension of the MCP joint with avulsion of the volar plate at the base of the first phalanx. However, they were unable to reproduce these lesions on cadaver fingers [6]. In contrast, Wood and Dobyns suggested as a mechanism forced hyperflexion of the MCP joint associated with translational force, imprinted on the dorsal surface of the first phalanx, generating proximal desinsertion of the dorsal joint capsule. They managed to reproduce these lesions by applying this mechanism to cadaver fingers [7]. The rupture of collateral ligament suggests that there is a rotatory component to the injury as reported by Betz et al. and Wood [4,7].

Multiple and open dislocations or fractures-dislocations of the MCP joints are rare [8,9]. The

index and little finger MCP joints are the most frequently involved due to the unprotected position of these two digits [2,8].

Our reported case regroups many rare characteristics of an injury of MCP joints; it consists in open multiple volar fractures-dislocations of the MCP joints of the index, the long finger and the ring finger.

It is interesting to mention that in case of closed fracture-dislocation of the MCP joint, the open reduction is the most practical because of the interposition of the surrounding soft tissues (dorsal joint capsule, volar plate, MCP ligaments) between the articular surfaces and the difficulty of reduction of the fracture by external maneuvers.

Both dorsal and volar approaches have been advocated to achieve reduction of complex MCP dislocations and fractures-dislocations after removal of the incarcerated volar plate from the joint and repair of all torn ligaments as detailed by Moneim [10].

According to Craig et al., the advantages of the dorsal approach are avoidance of digital nerves and better exposure of the volar plate and ligaments of MCP joint [2].

In the case of our patient, the dorsal wound allowed us to have a good reduction and stabilization of the fracture-dislocation of MCP joints as it was done in the case of fracture-dislocation of the 5th MCP joint reported by Craig et al. where the dorsal approach allowed to visualize, reduce and stabilize the fracture, leading to conclude that successful fixation of the fracture associated to dislocation would have been impossible via a volar approach [2].

Likewise, Calfee and Sommerkamp mentioned that the dorsal approach is useful if a shearing fracture on the dorsal metacarpal head requires treatment [3]. Ramzi, et al. are among the advocates of the volar approach in case of MCP joint dislocation but didn't miss to mention that it has its limits when a fracture of the metacarpal head is associated to the dislocation [11].

The most feared complication in this kind of injury is the stiffness of MCP joints. An early and well conducted rehabilitation program allows avoiding stiffness and represents the only guarantor of a good functional result.

Longitudinal division or removal of volar plate have been theorized to contribute to late MCP

joint chronic instability as reported by Ramzi, et al. [11] but this has not been substantiated [3].

4. CONCLUSION

Open multiple volar fractures-dislocations of MCP joints are exceptional. Their diagnosis is clinico-radiological. Open reduction allows having a good stabilization after desincarceration of the soft tissues. Dorsal approach is superior to the volar one as it offers a better exposure and allows performing a successful reduction and stabilization. The management of such injury must ensure a sufficient stability allowing an early rehabilitation which is the only guarantor of a complete functional recovery.

CONSENT

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Atiyya AN, Soliman RA. Simultaneous open and closed dislocation of four metacarpophalangeal joints: A case report and review of literature. *J Orthop Case Rep.* 2016;6(3):67-69.
2. Fultz CW, Buchanan JR. Complex fracture-dislocation of the metacarpophalangeal joint. *Case report. Clin Orthop Relat Res.* 1988;227:255-60.
3. Calfee RP, Sommerkamp TG. Fracture-dislocation about the finger joints. *Journal of Hand Surgery.* 2009;34(6):1140-1147.
4. Betz RR, Browne EZ, Perry GB, Resnick EJ. The complex volar metacarpophalangeal-joint dislocation. A case report and review of the literature. *J Bone Joint Surg Am.* 1982;64(9):1374-5.
5. McLaughlin HL. Complex "locked" dislocation of the metacarpophalangeal joints. *J Trauma.* 1965;5(6):683-8. PubMed PMID: 5851118
6. Renshaw TS, Louis DS. Complex volar dislocation of the metacarpophalangeal

- joint: A case report. J Trauma. 1973;13 (12):1086-8.
7. Wood MB, Dobyns JH. Chronic, complex volar dislocation of the metacarpophalangeal joint. J Hand Surg Am. 1981;6(1):73-6.
 8. Stowell JF, Rennie WP. Simultaneous open and closed dislocations of adjacent metacarpophalangeal joints: A case report. J Emerg Med. 2002;23(4):355-8.
 9. Fraser KE, Stamer DT. Open dorsal dislocations of the index, long, ring and small finger metacarpophalangeal joints. J Hand Surg Am. 1995;20(4):576-7.
 10. Moneim MS. Volar dislocation of the metacarpophalangeal joint. Pathologic anatomy and report of two cases. Clin Orthop Relat Res. 1983;176:186-9.
 11. Ramzi Z, Elgourty A, Ayyadi H, Elhaoury H, Madhar M, Chafi R, Fikry T. Luxation complexe de la métacarpophalangienne du 5e doigt – À propos de deux cas. Hand Surgery and Rehabilitation. 2016;35(6): 475.

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