International Journal of Research in Orthopaedics
Malisorn S. Int J Res Orthop. 2024 Jan;10(1):173-177
http://www.ijoro.org

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20234059

Case Report

Dislocation of the metacarpophalangeal joint: a narrative review treatment and examination

Saran Malisorn*

Department of Orthopaedics, Naresuan University Hospital, Phitsanuloke, Thailand

Received: 27 October 2023
Accepted: 02 December 2023

***Correspondence:**
Dr. Saran Malisorn,
E-mail: saranm@nu.ac.th

ABSTRACT

The dislocation of the metacarpophalangeal (MCP) joint is complex, often occurs due to complications from excessive stretching or overextension that cannot be reduced. The volar plate moves to back of the head metacarpal bone and the base of the proximal phalanx that is near the proximal phalanx, acting as an obstruction to the contraction. Although it is true that pathophysiology is relatively complex, the resulting damage is not normal, and the reduction of such damage often depends on experience. Present a case of a complex fracture of the MCP joint, along with a review of the literature on the anatomical relationship and therapeutic armamentarium.

Keywords: MCP joint, Dislocation, Finger joint, Complex dislocation, Open reduction

INTRODUCTION

The dislocation of the MCP joint at the dorsal side of the bone often occurs due to sudden force application, causing excessive extension of the joint. The dislocation mentioned above is often found in the index and little fingers. If there is no complex intervening structure, dislocation may decrease according to the principles of anatomy, relying on hand movements such as wrist flexion and gradually pulling the volar vector of the metacarpal bone base. Irregularly distributed soft tissue structures can be found between the metacarpal bones and adjacent part, leading to a continuous dislocation that cannot be reduced through closed maneuvers.[1] Kaplan provided a detailed description of this injury, the bony from the lateral view and the wider joint space from the anterior and posterior views, indicating this diagnosis.[2]

Due to the presence of the most significant obstruction that hinders flexion, which is the volar plate that is replaced located between the metacarpal bone and the adjacent base of the metacarpal bone. The surgical reduction aims to restore this structure back to its original position, regardless of how seemingly simple it may appear. The dislocation results in increased tension of the periarticular structures, which serve as a "locking" mechanism for the bone and volar plate. At the same time, efficient palm access while preserving the surrounding nerves is a general goal in all surgical procedures.

CASE REPORT

This is a description of such cases and review of the anatomical pathology and treatment approach for the following case: The 17-year-old male patient came to the emergency department with an injury to his left index finger from excessive stretching or extension, resulting in a change in shape of the MCP joint. Upon examination, it was found that there were Fovea's on the volar skin and normal sensation. X-rays of the back and side were taken, but closed reduction was unsuccessful. Therefore, the patient was taken to the operating room for open reduction. The stretching of the palmar skin can be observed at the level of the crease lines of the distal palmar. X-ray of the right index finger, due to the dislocation of the MCP joint. If left untreated, it may result in the formation of wounds on the skin. There is limited flexion of the index finger, and no abnormality of the blood vessels in nervous system was found. The X-ray reveals the dislocation of the bones in the back side of the index finger that is adjacent and the fracture of the ulnar bone of the second metacarpal bone

(Figure 1). There was an attempt close reduction at the hospital, but it was not successful. Oblique view reveals the dislocation of the posterior aspect of adjacent group.

Under specific anesthesia administration, volar Brunner incision will be made under magnified visualization to avoid injury to blood vessels. The metacarpal bone that protrudes beneath the delicate superficial tissue layer and the inner nerve blood vessels. The ulnar and radial sides of the flexor tendon impacts the metacarpal bone, while the volar plate is torn completely on the dorsal side of the metacarpal bone. As there is something attached along with metacarpal bone, smooth surface of the Freer elevator will be positioned between the volar plate and the adjacent structures. Then, palm is pulled out to visualize and bring the adjacent portion of the volar plate into visible surgery. This movement is performed along axis of metacarpal bone, releasing the muscle tendons simultaneously. It starts at the adjacent edge and ensures that other structures not get any damage. Volar plate will be incised longitudinally. This incision on the volar plate serves as an access pathway, allowing for repositioning of metacarpal bone from the dorsal side back to the volar side (Figure 2). When the volar plate is released, tension around the metacarpal bone will decrease, and the joint will naturally reduce by itself. Volar plate around the metacarpal bone will be closed and sutured with absorbable sutures. Additional dorsal ulnar incisions are made to help reduce dislocation part of bone. Size reduction of bone fragments can be achieved by repositioning the soft tissues without the need for additional fixation. After closing the skin, dorsal block splint will be applied. It is recommended to start exercising and immediately flexion after recovery period and continue regular exercise in 2 weeks after the surgery. Splint will be removed after 3 weeks. Alignment of fractured metacarpal bones can be observed in the postoperative X-ray image at 3 weeks (Figure 3). Patient fully recovers within 3 months after surgery (Figure 4).

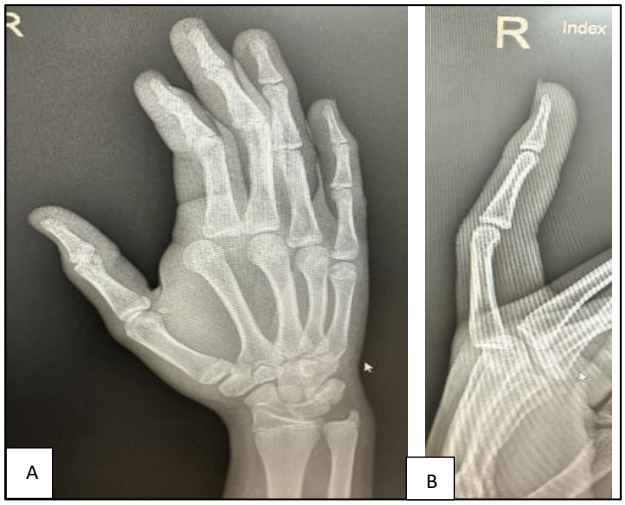

Figure 1 (A and B): X-ray image before to surgery anterior and posterior views. It shows a part of second metacarpal bone with an increased gap between fingers and widened palm.

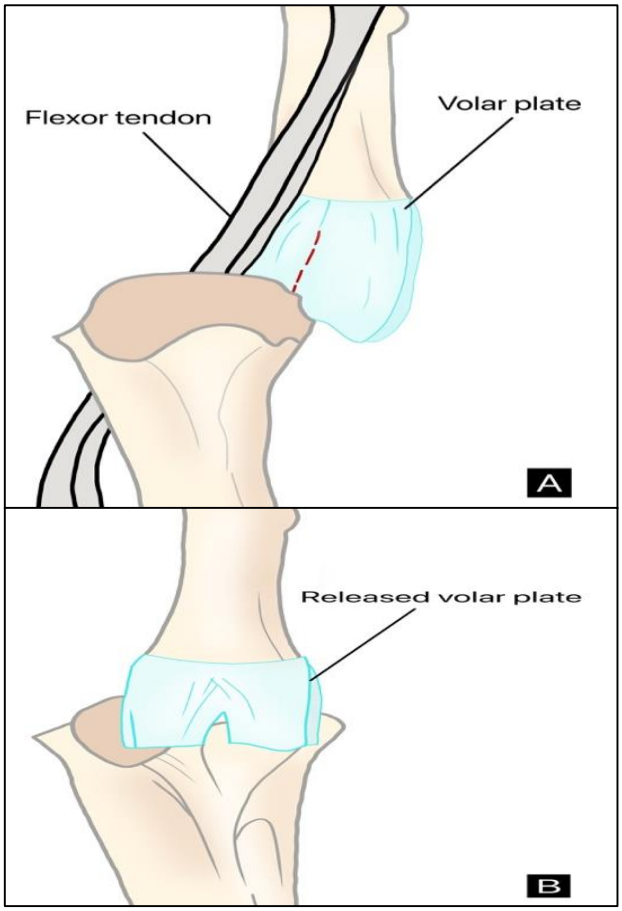

Figure 2 (A and B): Dislocation of torn volar plate. Volar plate that is disrupted is replaced from dorsal aspect to metacarpal head, indicated by red dashed line representing longitudinal incision of volar plate. Released volar plate is wrapped around metacarpal head after being released.

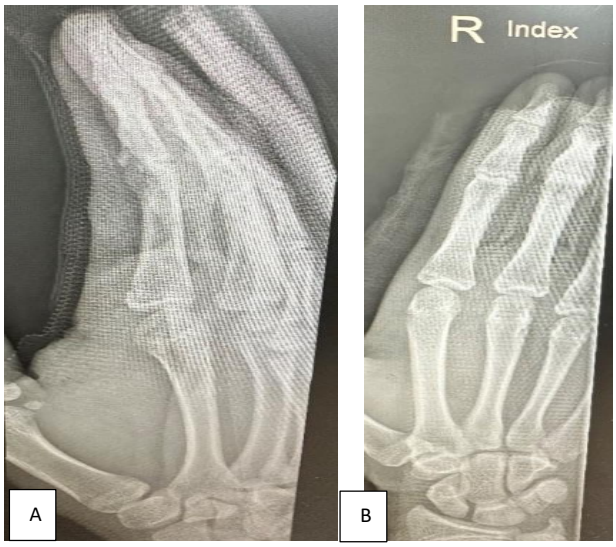

Figure 3 (A and B): The postoperative X-ray at 3 weeks shows the consolidation of the metacarpal bones as observed from the posterior view as observed from the oblique view.

Figure 4: Fully recovers within 3 months after surgery.

DISCUSSION

The dislocation of the MCP joint in the dorsal part often occurs due to the complications of injury that is excessive stretching and severe. The metacarpal bones will protrude outwards towards the palm, and the adjacent base of the bones will move backwards towards the metacarpal bones with pulling the periarticular structures towards the back. The normal periarticular structures of the MCP joint include the volar fibrocartilaginous plate, appropriate accessory ligaments, dorsal joint capsule, deep transverse metacarpal ligament (DTML), superficial transverse metacarpal ligament (STML), natatory ligament, sagittal bands, flexor tendon apparatus, lumbricals, interossei, and neurovascular bundles.

Kaplan was the first to provide a clear explanation of the conditions that cannot be rehabilitated and believed that the impingement of the natatory ligament, STML, flexor and lumbricals tendons prevent reduction. Anatomical pathology is related to treatment as its main objective is to unlock of joints that occurs differently in each individual.[2] The alternative theory suggests that the DTML, which is adjacent to the volar plate, creates a band with the posterior aspect of the metatarsal bone. Therefore, the release of the volar plate or this ligament can help reduce joint subluxation.[3] Afifi et al developed a physical model to study the dislocation of the MCP joint after surgery.[4] Testing machine that delivered controlled impact forces to the MCP joint of a stable hand from the cadaver. From the 6 developed models of the MCP joint, it was found that they were unable to reduce. They discovered that the muscle tendon was replaced by the A2 pulley, which remained unchanged, while the lumbrical muscle was replaced by the radial, extending to the metacarpal bone. The Radial digital nerve is located superficially or as radial to the metacarpal head. The Natatory ligament is distal to the joint, and the STML is located superficially at the neck of the metacarpal. The author observed that release of ligaments, STML, muscle tendons, and Lumbrical tendons cannot be reduced. This is achieved by dividing the structures step by step and with careful control. They explained that the release of the DTML, which is attached to the volar plate, allows the volar plate to move. However, the most crucial process is the release of the volar plate.[4]

Although most reports focus on the volar plate, the main structures that contribute to the ability to reduce in size may vary in each case. Orozco and Rayan found a patient in whom the main structures involved were the muscles and tendons located in posterior midline, while the secondary structures were the tendons attached to the fascia.[5]

Both the dorsal and volar approaches have been supported for surgical treatment. The volar approach that was described by Kaplan focuses on the carpal bones to observe and access the volar plate simultaneously.[2] This is because the movable volar plate cannot be directly visualized during surgery through the surgical window. One major advantage of this approach is that it allows for the repair and reconstruction of the divided plate in later.[6] Dinh et al cautioned about the potential injury to the nerve blood vessels group, which sometimes extends above the metacarpal head and is almost at the level of the direct skin incision, others argue that direct visualization facilitates easier protection.[7]

With the volar approach, some surgeons have reported the necessity of performing a second dorsal incision to achieve successful size reduction surgery.[8] The volar plate is no longer located in a volar position but is instead situated between adjacent groups and metacarpal bones. Therefore, it is equally challenging to access from both procedures. Therefore, recent studies support the use of open dorsal approach, as described by Farabeuf, which provides excellent visualization of the volar plate and carries less risk than surgery directly through the anatomy of the vascular nervous system.[9] From the retrospective comparative analysis conducted by Vadala and Ward, it was found that performing surgery specifically on the dorsal aspect helps reduce the surgical time and eliminates the need for a second incision to decrease the size.[6] The

challenge, however, is the inability to repair the volar plate, which is a necessary step to prevent recurrent dislocation.

Another option in cases involving the index or little finger is the lateral approach. Pereira et al suggest that this approach provides a comprehensive view of both the dorsal and volar structures, allowing for direct reduction of all types of bones and avoiding the risk of tendon adhesion or wound contracture along the axis of motion. However, similar to the volar approach, caution is necessary to preserve the structure of the blood vessels.[10]

There are reports on the least invasive procedures, which mostly occur in pediatric patients. Kodama et al describing the application of arthroscopy in the MCP joint of the index finger demonstrates the ability to reduce the size of the volar plate without the need for separation.[11] The previously mentioned technique can be performed under the use of specific anesthesia, which helps patients avoid the risk of general anesthesia. However, the repeatability of these procedures has not been examined, and arthroscopy may require skills and in repairing the volar plate has

Limitations

Although there is no best way to treat, all studies consider an accurate diagnosis to be the most important. The observed hand dorsum dislocation and wrinkling of the skin on the back of the palm are indicative of the pathological condition. Similarly, the presence of Sesamoid bones within the joint gaps serves as an indicator as well.[12] Computed tomography or magnetic resonance imaging may reveal the volar plate and flexor tendons, but diagnosis often relies on physical findings and conventional X-ray imaging.[13]

Choi et al previously reported a case of treating a little finger using the open volar approach, as described by Kaplan.[14] The pathophysiology of that lesion closely resembles of our case. However, in our case, it is a closed wound, making it challenging to diagnose upon presentation. The closed complex dislocation of the posterior bones also has a risk of injury to the adjacent nerves and blood vessels during incision near the volar plate.

Although the authors in case report, the author was able to reduce the volar plate without the need for additional incisions. The fracture in this case was limited to the proximal border, therefore, the reduction could not be achieved without a longitudinal open approach. Our patient differs in that the condition occurred in the index finger and has a fracture of one of the metacarpal bones.

Rehabilitation starting from the initial stages is crucial in preventing joint stiffness and achieving complete functional recovery. Cheah and colleagues specify that although there may be a 10-day period of immobilisation, joint pain can still occur.[15] If the joint regains stability after surgery, controlled exercise can be initiated starting from the day after the surgery to protect the newly repaired volar plate. It is advisable to advise patients to avoid excessive joint stretching. It is recommended to use splints to protect the back area and prevent overstretching. However, the splints should be removed during exercise. Moreover, it is recommended to maintain a balanced and comprehensive approach to positioning and stretching throughout the healing process.

The unstable side may benefit from finger tapping during exercise by using adjacent fingers to tap against each other.[2]

Without proper diagnosis, treatment, and rehabilitation, the complex posterior bones dislocation of the MCP joint can lead to severe limitations in motion and joint instability. This can potentially result in conditions such as arthritis or even serious infection.[15] This injury is not a normal occurrence, but appropriate size reduction and rehabilitation can help achieve full recovery. Therefore, physicians should consider the possibility of diagnosis when encountering such patients.

Complications such as arthritis and avascular necrosis of the metacarpal bone can occur as a result of open or late reductions in cases of injury.[16] Damage to the blood vessels can occur during open surgical treatment.[17] Excessive stiffness and reduced range of motion at the end range may result from prolonged immobilization or severe compression of adjacent tissues. The best outcomes of injury can be observed when intervention is carried out within the first day of injury.[18] Postoperative management for the movement of the posterior aspect of the MCP joint includes splinting in a functional position for up to 3 weeks, typically resulting in complete recovery of motion within 4 to 6 weeks.[19]

CONCLUSION

Complex posterior MCP joint dislocation is rare and often requires open surgery for the treatment. The surgical approach allows for better visualization of the volar plate and improved visualization of the compressed metacarpal head. Surgery and careful management of the vascular bundle are necessary to avoid damage to the digital nerves and blood vessels. If open surgery treatment for non-reducible MCP joint dislocation is not performed in a timely manner, full recovery and range of motion may take up to 4 to 6 weeks after surgery.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Elghoul N, Bouya A, Jalal Y, Zaddoug O, Benchakroun M, Jaafar A. Complex

metacarpophalangeal joint dislocation of the litter finger: A sesamoid bone seen within joint. What does it mean? Trauma Case Rep. 2019;23:100225.
2. Kaplan EB. Dorsal dislocation of the metacarpophalangeal joint of the index finger. J Bone Joint Surg Am. 1957;39-A(5):1081-6.
3. Beylich T, Schmidt I. Open Dislocation Injury of the Metacarpophalangeal Joints III-V: Case Report. Plast Reconstr Surg Glob Open. 2021;9(2):e3424.
4. Afifi AM, Medoro A, Salas C, Mahmoud RT, Tahseen C. A cadaver model that investigates irreducible metacarpophalangeal joint dislocation. J Hand Surg Am. 2009;34:1506-11.
5. Orozco JR, Rayan GM. Complex dorsal metacarpophalangeal joint dislocation caused by interosseous tendon entrapment: case report. J Hand Surg Am. 2008;33(4):555-7.
6. Vadala CJ, Ward CM. Dorsal approach decreases operative time for complex metacarpophalangeal dislocations. J Hand Surg Am. 2016;41(9):e259-62.
7. Dinh P, Franklin A, Hutchinson B, Schnall SB, Fassola I. Metacarpophalangeal joint dislocation. J Am Acad Orthop Surg. 2009;17(5):318-24.
8. Becton JL, Christian JD Jr, Goodwin HN, Jackson 3rd JG. A simplified technique for treating the complex dislocation of the index metacarpophalangeal joint. J Bone Joint Surg Am. 1975;57(5):698-700.
9. Farabeuf LH. Dislocation of the thumb backwards. Edinb Med J. 1877;23(1):85.
10. Pereira JM, Quesado M, Silva M, João DDC, Hélder N, Jorge A. The lateral approach in the surgical treatment of a complex dorsal metacarpophalangeal joint dislocation of the index finger. Case Rep Orthop. 2019;2019:1063829.
11. Kodama A, Itotani Y, Mizuseki T. Arthroscopic reduction of complex dorsal metacarpophalangeal dislocation of index finger. Arthrosc Tech. 2014;3(2):e261-4.
12. Gerrand CH, Shearer H. Complex dislocation of the metacarpophalangeal joint of the index finger with sesamoid entrapment. Injury. 1995;26(8):574-5.
13. Chitnis SS, Chitnis SL. Indication for CT following index finger metacarpophalangeal joint dislocation: a case report. Trauma Case Rep. 2018;18:31-6.
14. Choi SJ, Kwon BC, Lee YB, Shin WH. Open Reduction Through the Modified Volar Approach in Complex Dorsal Dislocations of the Metacarpophalangeal Joint. J Korean Soc Surg Hand. 2011;16(3):149-53.
15. Cheah AE, Tan DM, Chong AK, Chew WY. Volar plating for unstable proximal interphalangeal joint dorsal fracture-dislocations. J Hand Surg Am. 2012;37(1):28-33.
16. Wolfe SW, Hotchkiss RN, Pederson WC, Kozin SH, Cohen MS. Dislocations and ligament injuries of the digits. In: Green's Operative Hand Surgery. 8th ed. Philadelphia, PA: Elsevier. 2017;278-317.
17. Durakbasa O, Guneri B. The volar surgical approach in complex dorsal metacarpophalangeal dislocations. Injury. 2009;40(6):657-9.
18. Ip K, Wong L, Yu S. Dorsal dislocation of the metacarpophalangeal joint of the thumb: a case report. J Orthop Surg. 2008;16(1):124-6.
19. Mudgal CS, Mudgal S. Volar open reduction of complex metacarpophalangeal dislocation of the index finger. Tech Hand Up ExtremSurg. 2006;10(1):31-6.

Cite this article as: Malisorn S. Dislocation of the metacarpophalangeal joint: a narrative review treatment and examination. Int J Res Orthop 2024;10:173-7.