



2nd Metacarpophalangeal Joint Fracture Dislocation [Kaplan's Lesion] Operated by open Reduction with Dorsal Approach: A Case Report

Authors

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Abstract

The rare complex dislocation of metacarpophalangeal joint, also called Kaplan's lesion requires open reduction. In this dislocation, head of metacarpal is buttonholed within the various anatomical structures like capsulo-ligamentous attachments around the joint preventing closed reduction. Here we have dealt with the issue with the dorsal approach rather than the volar one as the former has the advantage of reduced neurovascular compromise and direct exposure of fibrocartilagenous volar plate blocking the reduction otherwise. After relocating the volar plate and k wire fixation of the metacarpal head, splinting done in early postoperative period with sequential removal of k-wires later and physiotherapy started. We suggest dorsal approach in view of better visualization, negligible injury to neurovascular bundle and better fixation of associated fracture.

Keywords: Kaplan's lesion, open reduction, dorsal approach, fibrocartilagenous volar plate.

Introduction

Kaplan's lesion, the rare dorsal complex dislocations of metacarpophalangeal joint involves usually the index finger¹. It is important to identify this lesion from subluxation as the latter can be reduced by closed methods whereas dislocations most often need an open reduction². The term complex dislocation was first coined by Farabeuf³ & later Kaplan published his article describing the numerous anatomical interposing structures which prevents reduction by closed methods which necessitates open reduction⁴. The patho-anatomy involves dislocation of the head of the metacarpal which gets button-holed within the various anatomical soft tissue structures around it.

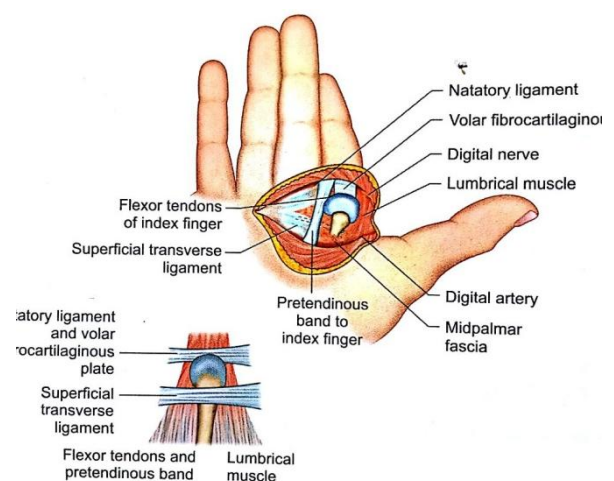


Figure 1: clinical patho-anatomy

Normally, the MCP joint dislocation prevented by the strong capsulo-ligamentous attachments. The capsule on the volar side attached to the metacarpal proximally & proximal phalanx base distally is reinforced by the volar plate. On the

radial side, the deep transverse metacarpal & collateral ligaments provide protection, while ulnar wards it is the extrinsic & intrinsic tendons along with the sagittal bands providing additional support thus preventing dislocation [figure- 1]⁵. However, due to extra force of injury the volar plate & capsule which has a thin attachment to the metacarpal; breaks & dislocation eventually occurs. The culprit is usually the volar plate which prevents relocation by closed methods. A fall with forceful hyperextension of the finger is usual mode of injury. The volar plate breaks from its proximal attachment of metacarpal neck most often maintaining its attachment to deep transverse ligament. It then interposes between the metacarpal head & proximal phalanx, which leads to formation of a primary impediment for closed reduction. Further the flexor tendons on the ulnar side along with the pre-tendinous band of palmar fascia & the lumbricals radial ward form a tight constriction noose or a button hole like phenomenon for the head of the metacarpal preventing its reduction⁶⁻¹⁰. Attempt to do closed reduction in these situations will tighten the noose around the head and vigorous multiple attempts may lead to fracture of metacarpal head. Hence open reduction is imperative in this condition. The index finger is most commonly affected^{11,12} followed by the little finger. However the ring & the middle fingers escape isolated injuries due to support from neighbouring digits & strong deep transverse metacarpal ligaments¹³. Proper clinical examination & radiological assessment is a must to identify this condition & treat with accordance. For open reduction - the dorsal & the Volar, are the two primary approaches described. Though, the right approach to treat such lesions is still a debate^{10,16,17}, it is the volar approach which is widely used & described more in literature^{6,8,14,15}. Some prefer dorsal approach^{7,9,13}. Volar approach is precarious to injure the neurovascular structures.

Case Report

A 60 year old house wife, presented with pain and swelling over right hand, around index finger, when she sustained injury to volar aspect of outstretched finger while fall from standing while doing her daily peruses at home. With the patient under local anaesthesia, closed manipulation and plaster splints were tried multiple times, in another institute, but with no success. Getting no conclusive results, patient came to our institute after 22 days of sustaining injury, for further management. On examination, there was hyperextension at 2nd metacarpophalangeal joint (figure 2), and distal digit was slightly deviated towards middle finger. The distal and middle IP joints were flexed, and extensor tendons were relaxed. There was a smooth round shaped bony mass formed by the head of 2nd metacarpal on volar aspect of hand with puckering bilaterally.



Figure 2 Clinical photographs



Figure 3 roentgenogram

There was no distal neurovascular deficit. X-rays (figure 3) was suggestive of dorsal dislocation of proximal phalanx of the right index finger with

volar displacement of fragment of fractured metacarpal head. Based on this picture, dorsal open reduction was attempted for this complex metacarpophalangeal joint dislocation.

Surgical Procedure

With the patient in supine position, in regional anaesthesia in the form of brachial block, Patient was positioned with tourniquet, used to obtain bloodless field during surgery. Painting and draping was done in usual fashion to have an aseptic field. Dorsal approach was used. For that, curvilinear incision was made in dorsal aspect of index finger extending in the 2nd web space. The extensor mechanism was identified & incised on the ulnar side. The visible part of capsule, thus exposed was carefully incised longitudinally with a 11 number blade. The collateral ligaments were found caught within the joint which were released. We were able to gently retract them aside. Then the volar plate was visible which was strong, taut, shiny & glistening white in colour resembling the capsule. This volar plate was completely dorsally dislocated. Head of metacarpal found fractured. A longitudinal incision was made over the plate in the centre & with a small retractor or a curved small artery forceps the head of the metacarpal was gently elevated & allowed to relocate between the cut ends of the plate. The leaflets of the plate move away ulnar & radial ward allowing the relocation to occur concentrically. Stability & adequacy of the reduction was noted by moving the finger in flexion & extension & by direct visualisation under naked eye. K wire was inserted through fracture head into shaft and other one from base of proximal phalanx through fracture fragment to metacarpal (figure 4) so as to transfix the metacarpo-phalangeal joint.



Figure 4 Post-operative Roentgenogram

Following reduction. The capsule was re-sutured & the ulnar part of the extensor mechanism was reconstructed using vicryl sutures. This is to prevent instability & iatrogenic subluxation or dislocation. The wound was washed thoroughly & sutured. Puckering of the skin on the volar side & void on the dorsal side disappeared as joint relocated post operative straight cock up slab applied up to proximal interphalangeal joints. No neurovascular damage was noted.

Follow-Up

Patient was discharged on the 3rd Post-Operative day. The sutures were removed on 14th post-operative day. The wires were pulled out sequentially one after another at 3 weeks and 6 weeks. First, the one transfixing the metacarpophalangeal joint and later, the another one & the splint was discarded after 3 weeks allowing gradual mobilisation.

Patient was followed weekly for the first 3 weeks & later once a month for 3 visits. Total visits were 6 & the duration of follow-up were 3.5 months. Check X-ray was done once post-operatively and at 3 and 6 weeks. Physiotherapy in the form of strengthening exercises was started after 6 weeks & once patient had regained >70% of previous movement.

Results

As follow-up after 6 weeks, the patient's active range of motion consisted of metacarpophalangeal

joint hyperextension to 10° and 75° of flexion, proximal interphalangeal joint extension to 0° and flexion to 70°, and distal interphalangeal joint extension to 0° and flexion to 60°. Neurovascular evaluation was within normal limits. X-rays confirmed maintenance of reduction.

Discussion

Out of the two main approaches described for open reduction- volar & dorsal, extensive literature has been written on volar approach by Kaplan & other authors^{6,8,10,15-21}. In this approach it was required to extensively release the volar structures along with the volar plate, thus, the primary impediment & the risk to radial neurovascular bundle (digital nerve & vessel) was high. That's how made dorsal approach was popularised^{7,9,13} in which dorsal approach the risk of injury to the neurovascular bundle is much less as it lies between the MC head & skin volar wards. It was Becton et al⁷ who reported a series of 9 cases complex MP joint dislocations treated by both approaches. He found that few patients treated with volar approach had a sensory loss on the radial aspect of the injured finger while those treated with dorsal approach had full recovery with normal function. He concluded that dorsal approach was the right approach to treat such lesions. The need to release the superficial transverse metacarpal ligament & distal transverse fibres (Notatory ligament) was advocated by Kaplan. De Coster^{22,23} advised not to release them unless they obstruct or interfere in reduction. The risk of iatrogenic dislocation following release of ligaments is also reported. In our case, reduction was achieved without release of the above ligaments & hence, the ligaments were left intact & no re-dislocation occurred.

Many a times, deep transverse ligament is also a big obstacle for proper reduction to take place. Murphy¹⁸ reported the role of volar subluxation of deep transverse metacarpal ligament which forms a part of the noose around the head of MC & prevents reduction. This also needs release if it prevents reduction. We did not face such problem

& hence did not release it. By in dorsal approach, management of osteochondral fractures was much easier. Osteochondral fractures were noted in nearly half of these lesions (Becton & Bohart)^{7,9}. The fracture fragments are on the dorsal side & are ideally addressed by dorsal approach. We also had fractures in the metacarpal head which was managed with dorsal approach with ease.

The main culprit of this lesion is the volar plate. It dislocates dorsally & lies between the joint which prevents the reduction. It can be directly visualised by the naked eye, by dorsal approach, as a glistening white structure similar to the capsule. To facilitate reduction, care should be taken to identify it properly & incise it longitudinally.

Volar plate, as mentioned earlier provides stability to the joint volar wards; longitudinal splitting of this volar plate is usually criticised as it causing delay in recovery, needs more immobilisation & leads to instability of the joint which may result in iatrogenic dislocation or subluxations later²⁴

Conclusion

Dorsal and volar both approaches can be used for the complex dislocations of MCP joint. As discussed above the Dorsal approach is better in view of reducing the possibility of neurovascular compromise. Though, extensive follow-up and clinical evaluation should be executed combined so as to thoroughly assess the effectiveness of both methods.

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