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Complex Kaplan's lesion of the thumb managed by an open dorsal approach: A rare case report

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Abstract

This case report presents a comprehensive account of the successful management of a complex Kaplan's Lesion of the thumb utilizing a modified open dorsal approach and provide insights into the surgical procedure, postoperative outcomes, and the effectiveness of this approach in addressing such a challenging case. A patient presented with a complex Kaplan's Lesion of the thumb, characterized by dislocation with absence of any fractures. The decision to employ an open dorsal approach was based on careful preoperative clinical and radiological assessment and considerations of the lesion complexity. A detailed description of the closed reduction and open dorsal approach, including incision placement, tissue dissection, and repositioning of the joint was done, with special attention given to preserving the volar plate critical for thumb functionality. The effectiveness of this approach in managing complex Kaplan's Lesion is critically evaluated, considering both aesthetic and functional aspects. This case report emphasizes on viability of the open dorsal approach in successfully managing complex Kaplan's Lesions of the thumb. The insights gained from this case offer valuable guidance for surgeons faced with similar cases.

Keywords: Kaplan lesion, dorsal approach, open reduction

Introduction

Finger dislocations account for 5% of upper extremity injuries ^[1]. Metacarpophalangeal joint dislocations post trauma are of rare occurrence, especially the complex irreducible variety. In 1876, Farabeuf *et al.* first described complex MCP dislocation in the index finger but described little about MCP dislocation in the thumb. In 1957, Kaplan described anatomy and pathophysiology of the metacarpal head of the index finger buttonholing into the tissues of the palm and reasons for the inability to reduce it closed ^[2, 3]. In the MCP joints, the four volar plates of the fingers and the capsules within which they lie are blended with and interconnected by the deep transverse metacarpal ligament which ties the metacarpal heads together. Dorsal to this ligament on each side of the metacarpal heads are sagittal bands that connect the volar plates to the tendon of the extensor digitorum and to the extensor expansion. These bands help stabilise the volar plates over the metacarpal heads ^[4]. In contrast to the volar plates of the MCP joints of the fingers, the volar plate of the thumb MCP joint is a thick structure firmly attached to the base of the proximal phalanx. It forms the bottom of a two-sided box, the sides of which are made up of the collateral ligaments. Kaplan's lesion is an uncommon kind of dorsal complicated dislocation that affects the metacarpophalangeal joint ^[5]. Usually, it entails the use of the index finger at the metacarpophalangeal joint. This is a case report of a rare presentation presenting a comprehensive account of the successful management of a complex Kaplan's lesion of the thumb utilizing a modified open dorsal approach and provide insights into the surgical procedure, postoperative outcomes, and the effectiveness of this approach in addressing such a challenging case.

Materials and Methods

A 52-year-old female presented to us in the Emergency Department with complaints of pain, swelling and deformity over the left thumb due to a fall over an outstretched hand while climbing stairs on the way to her workplace. There was no further trauma to any other vital structures. The patient did not have any significant clinical or surgical history and was not on any concomitant medications. On clinical examination, there was a gross deformity over the MCP joint, with significant contusion over the thenar eminence, and subsequent swelling around the joint.

The range of motion was severely restricted, and the thumb was held in palmar flexion and adduction. There was no palpable crepitation felt. The thumb had no distal neurological deficit. There was puckering of the skin seen over the palmar surface of the MCP joint (Figure 1). On X-rays (Figure 1), there was significant palmar dislocation of the MCP joint with an interposing sesamoid bone between the base of the proximal phalanx. She was diagnosed with a complex Kaplan's Lesion of the Left Thumb and was posted for an emergency procedure after completing her pre-anaesthetic check-up. The patient was taken on the operating table in supine position under general anaesthesia, and tourniquet was applied. The left limb was isolated, scrubbed, painted, and draped. Tourniquet was inflated after exsanguinating the limb with an Esmarch's bandage. An initial trial of closed reduction was attempted but was unsuccessful. A z-type incision was taken over the dorsal aspect of the MCP joint. Careful dissection was done to protect the neurovascular bundles to reach the volar plate. The joint capsule was divided, and the volar plate was visualised and found interposed between the proximal and middle phalanx. At this stage we altered the surgical procedure from what is the norm. The standard technique is to incise and split the volar plate which may have long term consequences for the stability of this joint. Therefore, we did a combination of the closed traction manoeuvre while visualising the volar plate which we gently teased to its

palmar location using a McDonald's elevator. Articular cartilage of the proximal phalanx was seen and found to be intact with no signs of fracture or erosion (Figure 2). Once this was done, the proximal phalanx could be easily reduced onto the metacarpal head. With gentle traction over the distal phalanx, the shaft of the proximal phalanx was dorsally angulated and with the help of a McDonald's elevator, the displaced metacarpal was brought dorsally into approximation and reduced. Stable reduction was achieved. Saline wash was given and closure of the capsule and subcutaneous tissue was done with Vicryl 2-0 (Polyglactin) and skin with Ethilon 3-0 (Polyamide Monofilament). Tourniquet was deflated. Compressive dressing and a below elbow radial gutter slab was applied with the thumb in flexion. Medial and lateral collateral ligaments were found to be stable in flexion. Disappearance of the puckering of the volar skin over the joint was observed. X-rays taken post procedure showed the joint stable and in position (Figure 3 - 4).

Results

The Patient was discharged the following day with an arm sling pouch and was reviewed for a wound check in the OPD on post-operative day 3, followed by suture removal on day 10. The wound was found to be healing well with excellent range of motion over the 1st MCP joint with significant reduction in pain.



Fig 1: Preoperative clinical images showing puckering of skin over the palmar aspect of the MCP joint and radiological images of the left hand showing a Kaplan's lesion.



Fig 2: Series of images showing Division of joint capsule, volar plate being visualized interposed between the proximal and middle phalanx with intact articular cartilage no erosions or fracture followed by Stable reduction of Kaplan's lesion.



Fig 3: Series of images showing disappearance of the puckering and Post-operative radiological imaging showing stable and good reduction of the joint.



Fig 4: Post-operative radiological imaging showing good and stable reduction.

Discussion

The sturdy capsulo-ligamentous attachments around the MCP joint often serve as a barrier against dislocation. The capsule is connected to the proximal end of the metacarpal on the volar side. The base of the proximal phalanx is strengthened distally by the volar plate. The deep transverse metacarpal and collateral ligaments offer protection on the radial side. The ulnar side is supported by both the extrinsic and intrinsic tendons, as well as the sagittal bands, which help prevent dislocation [6, 7]. However, because of a forceful injury, the volar plate and capsule, which are thinly attached to the metacarpal, experience a fracture and subsequent dislocation. In this case, the finger was injured due to a fall that caused strong hyperextension. The volar plate commonly fractures at its proximal connection to the metacarpal neck, while remaining connected to the deep transverse ligament. It inserts itself between the metacarpal head and proximal phalanx, creating a main obstacle for closed reduction. The flexor tendons on the ulnar side, coupled with the Pre-tendinous band of palmar fascia and the lumbricals, create a constricting loop or buttonhole effect that prevents the metacarpal head from being reduced [8]. The index finger is often the most frequently impacted, whereas the thumb is the least affected [9] emphasizing the rarity of this case's appearance. Thorough clinical evaluation and radiological assessment are crucial for determining the nature of the deformity and selecting the most suitable approach for treatment. A distinctive indication of a complicated MCP joint dislocation is the contraction of the skin on the palm side, like the puckering observed in breast carcinoma. This signifies the necessity for an open reduction procedure [3]. Kaplan contended for the necessity of releasing the superficial transverse metacarpal ligament and the distal transverse fibres, also known as the Notatory ligament. Additionally, there have been reports of iatrogenic dislocation occurring after ligament relaxation, indicating a potential danger. In our procedure, we successfully achieved reduction without the need to release the ligaments. As a result, the ligaments remained intact and there was no occurrence of re-dislocation. The deep transverse metacarpal ligament can sometimes hinder the process of

reduction. Murphy [10] was the one who identified the importance of volar subluxation of the deep transverse metacarpal ligament, which is a component of the noose around the head of the metacarpal bone and hinders reduction. This also requires a release if it hinders reduction. We did not experience such an issue and so did not make it available. The main contributory factor of Kaplan's lesion is the volar plate, which undergoes dorsal dislocation and becomes positioned between the joint, hindering reduction [11]. During the dorsal approach, the structure may be easily seen with the naked eye as a shiny white object that resembles the capsule. It is important to accurately locate it and make a lengthwise incision to make the reduction process easier. The volar plate plays a crucial role in stabilizing the joint in a forward direction. However, when the volar plate splits lengthwise, it is often seen as problematic since it can prolong the healing process, need further immobilization, and contribute to joint instability. This instability can potentially cause dislocation or partial dislocation of the joint in the future. Nevertheless, this is purely hypothetical and there have been no documented cases indicating such problems. We did not encounter any such issue, and the outcome was positive.

Conclusion

This case report emphasizes on viability of the open dorsal approach in successfully managing complex Kaplan's Lesions of the thumb. A dorsal approach proved to be beneficial because: (1) volar plate was not incised, (2) adequate protection to the neurovascular bundle, (3) a combination of a closed manoeuvre and an open dorsal technique was used, (4) ease of access to the dorsal MCP joint, and (5) use of a simple orthopaedic instrument (McDonald's Elevator) to aid in the reduction and repositioning of the dislocated joint. The insights gained from this case offer valuable guidance for surgeons faced with similar cases.

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