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Case Report

Open Reduction and Transosseous Plasty of the Dorsal Scapholunate Ligament in a Patient with Mayfield type IV Chronic Lunate Dislocation, Case Report, Literature Review and Description of Surgical Technique

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Abstract

Introduction

Perilunate dislocations represent 3% of carpal injuries. They begin in a radial direction, destabilizing the scapholunate interval, and as the injury continues, there is a progressive sequence of instability, altering the anatomy of the carpus, causing significant functional deterioration. The acute diagnosis goes unnoticed, evolving into its chronic form. There are few reports of treatment in its chronic phase with a limited number of patients and follow-up evaluation is often limited.

Objective

We present a case of late diagnosis of chronic lunate dislocation that was managed surgically and review of the existing literature for diagnosis and treatment, as well as the surgical technique for its resolution.

Clinical case

66-year-old male, fall from the plane of support, hyperextension mechanism of the right wrist, 2 months of evolution causing pain, progressive increase in volume, functional limitation. Treated with non-steroidal anti-inflammatory drugs for four weeks without improvement. Radiographically, loss of lunate joint congruity - capitate. Magnetic resonance images of avascular necrosis of the lunate. Diagnosing chronic semilunar dislocation of the right hand. Preoperative Quick-Dash 70.4 pts. A double dorsal and volar approach is performed to release the carpal tunnel, place a transosseous cerclage, and three 1.6 mm Kirschner pins in the scapholunate interval; semilunopyramidal and scaphocapitate. Immobilization with antebrachipalmar splint, removal of Kirschner pins at 7 weeks and referral to physical rehabilitation. 20 postoperative weeks, range of motion with flexion of 35° and extension of 30°, without visible sequelae to mobilization, and with Quick-Dash 20.4.

Conclusion

Early diagnosis and treatment are necessary to prevent the potential risk of avascular necrosis of the lunate and scaphoid, and secondary osteoarthritis. Reconstruction of the chronic pathology of lunate dislocation and scapholunate ligament (SL) remains a major challenge. There are unresolved issues regarding when to perform reconstruction rather than repair and therefore treatment remains controversial.

Introduction

Perilunate carpal dislocation and dislocation are rare and often undiagnosed conditions [1] that occur as a result of high-energy trauma with the hand in hyperextension and ulnar deviation, being responsible for severe bone, cartilaginous and capsuloligamentous injuries. Which cause significant morbidity [2,3]. The stability between the scaphoid and lunate is given by ligamentous structures capable of maintaining joint congruity: the two scapholunate ligaments (dorsal and volar) and the proximal fibro cartilaginous membrane, which is arranged as a continuation of the proximal edges of the bones from dorsal to palmar and separates the radiocarpal and mid carpal joint spaces.

For its part, the dorsal scapholunate ligament is formed by thick and strong fibers made up of collagen I and III with a transverse orientation; It occupies a deep position in the dorsal capsule, and plays a fundamental role in scapholunate stability by connecting the dorsal aspects of the scaphoid and lunate; Furthermore, its anterior equivalent, the palmar scapholunate ligament, has long, thinner fibers in thickness with a greater oblique orientation that allows some sagittal rotation of the scaphoid in relation to the lunate, but has a less important role in the stability of the carpus. The dorsal scapholunate ligament has the greatest resistance to tension forces (average 260 Newtons), and is followed by the palmar scapholunate ligament (average 118 Newtons) and the proximal membrane (64 Newtons) [4-7].

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Perilunate dorsal dislocation involves a dorsal dislocation of the capitate with respect to the lunate, while the latter remains in a normal position in the fossa. In a volar dislocation, the capitate is reduced from its dorsally dislocated position to be collinear with the radius, thus dislocating the lunate in the carpal tunnel [8-12]. In 1993, Herzberg [9] classified perilunate dislocations as stage I and of the lunate, as stage II; In turn, the latter are classified as stage IIA when the lunate is dislocated and rotates less than 90°, and as stage IIB when the rotation is >90°. The traditional pathophysiology of carpal dislocations and dislocations, as described by Mayfield [10], is that of extension trauma, with ulnar deviation and intercarpal supination.

The resulting injury pattern depends on the type of three-dimensional loading, the magnitude and duration of the forces involved, the position of the hand at the time of impact, and the biomechanical properties of the bones and ligaments; Due to these variables, a perilunate dislocation or a lunate fracture dislocation may occur. The lesion sequence spreads in an ulnar direction over the lunate, with an initial interruption to the scapholunate interval. This force continues into Poirier's space, which is located on the volar and proximal aspect of the capitate. It extends between the volar radiocapitate and radiotriquetal ligaments, and interrupts the scapholunate joint before interruption of the lunotrichetal joint. Finally, the dorsal radiocarpal ligament fails, allowing the lunate to rotate around its proximal volar appendages and dislocate in the carpal tunnel. Different treatment regimens have been described for the management of perilunate lesions, including closed reduction and open reduction; however, the risk of recurrence, as well as nonunion and nonunion, has so far been described more frequently in patients undergoing closed reduction.

Therefore, open reduction with internal fixation has become the treatment of choice in most cases [7,11,13-15]. Early treatment of perilunate carpal injuries is important to prevent devastating complications such as chronic carpal instability and post-traumatic arthritis, especially evident in patients with neglected lesions or with inadequate management. The patients with long-standing dislocations may present late symptoms, even years after the injury, so in some isolated cases good functionality of the hand with minimal pain, although the most frequent is the presence of chronic pain, syndrome carpal tunnel or flexor tendon injuries attributable to wear and tear of the carpal bones dislocated [1,9,10]. The objective of this work is to present a clinical case of a patient with chronic lunate dislocation stage IV Mayfield, as well as the surgical technique used for its resolution.

Case Presentation

66-year-old male with a history of type 2 Diabetes Mellitus of 10 years of evolution in treatment and control. Current condition in June 2021 due to a fall in the support plane, with a hyperextension of the right wrist causing increased volume, severe pain and disability functional. Initially assessed by the emergency service, presenting increased volume, with ability to mobilize fingers, moderate pain. Diagnosed as contusion of right wrist. He is treated with analgesics and non-steroidal anti-inflammatory drugs for four weeks, with local thermal measures to reduce inflammation of the extremity. At four weeks without clinical improvement so he decided to make an appointment at the outpatient surgery clinic hand for revaluation.

He presented for consultation 3 months earlier with his right wrist held contralaterally; stabbing pain predominantly in the morning, which is exacerbated when performing daily activities and with partial improvement at rest.

Physical examination

Figure 1: A-C: Physical examination prior to surgical procedure. An increase in volume and severe limitation for flexion and extension of the right wrist with respect to the contralateral is observed. B-D: Decrease in pronosupination with dorsal deformity.

Right hand with increased volume, dorsal deformity (Figure 1).

Figure 2: AP and lateral projection of the right wrist with volar semilunar dislocation and loss of the anatomical relationship of the first row of the carpus.

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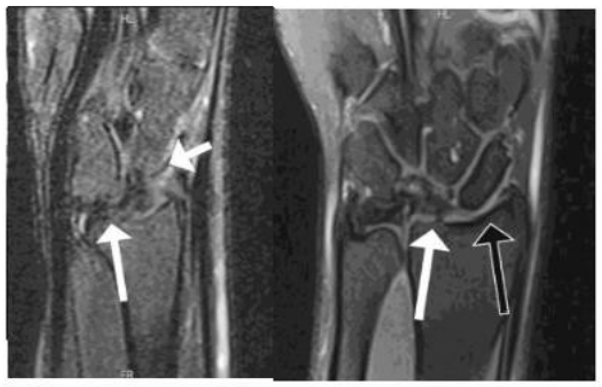

Figure 3: A) Dorsal inclination of the lunate with hypointensity data on T1, compatible with Lichtman grade 1 avascular necrosis; B) MRI complete rupture of the dorsal component of the scapholunate ligament (white arrow) widening of the scapholunate interval preservation of the radiolunar and radioscaphoid articular cartilage (black arrow).

Pain predominantly in the lunate fossa and the volar region which is exacerbated with extension. Muscular strength 3/5 Daniels and limitation in the ranges of movement with flexion and extension 15°/20°. Tinel test (+); Durkan (+); Phalen (+) in median nerve territory. Initial QuickDash 70.4° applied. A radiographic study was performed with anteroposterior and lateral projections of the right wrist (Figure 2) with volar dislocation of the lunate and loss of the anatomical relationship of the first row of the carpus. MRI of the right wrist with a report of complete rupture of the dorsal component of the scapholunate ligament and hypointensity data of the lunate on T1 and T2, cysts hypointense on T1, hyperintense on T2 compatible with grade 1 avascular necrosis Lichtman. Without degenerative changes of the articular cartilage (Figure 3).

Surgical Technique

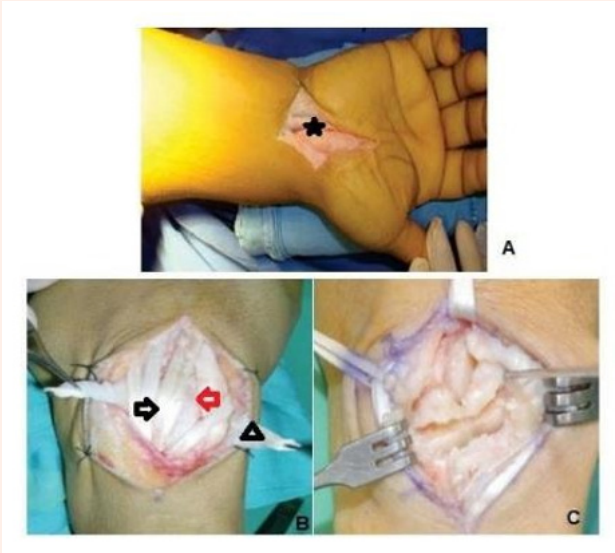

Figure 4: A) transsurgical image of the right wrist with release of the median nerve and opening of the transverse carpal ligament; B) second extender compartment (red arrow) fourth extender compartment (black arrow) Dorsal capsulotomy is performed with a radial base (triangle); C) Complete lesions of the scapholunate and semilunopyramidal ligaments are identified.

Patient in supine position after asepsis and ischemia placement, as well as sterile fields on right upper extremity. A volar approach is performed by making a skin incision of approximately 4 cm from the joint crease of the wrist in a proximal direction, starting at the along the ulnar edge of the tendon of the flexor carpi radialis muscle; Z-shaped extension towards the palm of the hand along the thenar fold. Release of the median nerve is performed with the opening of the annular ligament of the carpus (Figure 4A). The flexor tendons and median nerve can then be alternately retracted in radial and ulnar direction in order to obtain a good view of the entire complex palmar carpal ligament. Lunar reduction maneuvers are performed, repairs are made long radio-lunate ligaments and the ulno-lunar ligament, on the one hand, and the scaphocapitate radius ligament and the ulnopyramidal ligament on the other.

The approach is performed through the extensor aspect over the third extensor compartment. It opens the retinaculum of the extensor tendon in a Z shape and the strips of the retinaculum are retracted laterally. They open the second to fifth extensor compartments to be able to retract the tendons. After placing a blunt retractor to separate the extensor tendons, the capsule is presented joint and the dorsal ligamentous complex of the wrist. Dorsal capsulotomy is performed with base radial according to Berger and Bishop (Figure 4B). Complete lesions of the scapholunate and semilunopyramidal ligaments are identified (this last with remnant) (Figure 4C) as well as the absence of signs degenerative in the lunate fossa of the radius, in the head of the capitate and itself lunate.

Two Kirschner pins are inserted over the scaphoid and lunate as joysticks to direct the reduction. Once the scaphoid and lunate have been reduced with respect to the radius, it is introduced through percutaneously a 1.6 mm Kirchner pin from the scaphoid to the lunate. It is checked the position of the carpus with the use of image intensifier in both planes and a second Kirshner pin 1.6 mm from the scaphoid towards the capitate. Finally, the placement of a third Kirschner pin starting from the lunate towards the pyramidal. Transosseous drilling is carried out through the lunate and scaphoid and the 0.0° surgical use wire. Primary repair of the semilupyramidal ligament is performed.

Figure 5: Dorsopalmar and oblique of the right hand lunate-capitate joint congruence with stabilization 3 kishner pins between the scapholunate semilunopyramidal and lunate-capitate intervals.

Figure 6: Dorsopalmar and oblique of the right hand after 7 weeks postoperatively where Kirshner pins are removed. Transosseous wire is seen within the scapholunate interval.

Once the tourniquet is removed, correct hemostasis and closure of both approaches will be performed by plans. After the intervention, an antebrachypalmar splint is placed. Two weeks later he went to the outpatient clinic for follow-up, and the antebrachypalmar splint was removed of the right upper extremity, with the presence of a well-fronted volar and dorsal wound, with good healing, with the presence of three Kirschner pins without signs of loosening, (Figure 5A-D) nor data of active infection. Upon examination of the right hand with the ability to mobilization of the five fingers, immediate capillary refill, sensitivity present, and paresthesias over territory of the median nerve. We removed Kirschner pins at 7 weeks, and he was sent to begin early rehabilitation. In it 16-week follow-up with limited flexion 20°-20° extension, continuous with paresthesias on thumb, index and middle fingers and EVA 2/10 (Figure 6E-F). At 20 weeks postoperative, 35° flexion, 30° extension, no pain, no paresthesia.

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Figure 7: Dorsopalmar and lateral radiographs of the right wrist in flexion and extension at two years of postoperative follow-up showing minimal sclerosis, without collapse of the lunate.

The percentage of movement with respect to the contralateral wrist reached 70% for flexion and a 50% for the extension. Quick Dash scale is applied with a result of 20.4 pts. After two years of follow-up, the patient presents occasional mild pain. The neurological symptoms of the median nerve disappeared. It has a joint balance of 32°/ 30° for flexion- extension and a force of 65% with respect to the contralateral hand. The study radiographic showing minimal sclerosis; without collapse of the lunate. Reinstated to his work activities as a craftsman (Figure 7).

Discussion

The hand is an organ of mobility and sensitivity. Unlike the lower extremity, it does not requires a development of power to develop its functions, but rather correct stability. Isolated dislocation of the lunate causes it to lose its normal anatomical relationships with the radius and the carpus. It is of the palmar type, as in the case presented. The dorsal location it is extremely rare. The usual mechanism of injury involves a combination of extension, carpal supination, and ulnar deviation of the wrist; this occurs when a force is applied to the palm of the hand with the wrist in hyperextension and the radius fixed in pronation.

During the trauma, the dorsal radioulnar ligament is torn, and the ligament remains intact anterior radioulnar. By breaking the lunate in the carpal canal, it produces compression on the median nerve and could cause paralysis of this nerve. In this case, due to the marked displacement of the bone, rupture of the pedicle was very likely provided by the anterior radiolunar ligament; although at the time of radiological diagnosis there were no signs of necrosis, the vascular prognosis of the lunate was reserved. Herzberg classifies these injuries into two grades depending on the location of the lunate with regarding its socket in the radius, the degree of rotation it entails and the arrangement of the capitate.

Grade I

The lunate is located in the semilunar fossa of the radius. The capitate may be dislocated towards the dorsal part of the lunate or rarely, towards the volar. Grade II when the lunate is dislocated of the semilunar fossa of the radius, the capitate being located dorsally of the lunate or rarely, he made fly. It is subdivided into IIA: when the lunate is rotated less than 90° and IIB when rotated more than 90°.

Campbell reports on three patients who presented with chronic volar dislocation of the lunate in where open reduction and internal fixation were performed. The interval between injury and operation was of 7,8,14 and 18 weeks, respectively. Surgical approaches were necessary, both palmar and as dorsals in order to reduce chronic dislocation and decompression of the carpal tunnel.

A case of dorsal transscaphoid perilunate dislocation showed concurrent partial rupture of the scapholunate ligament. In three patients, transient vascular compromise of the semilunar or proximal scaphoid fragment. Despite the delay in treatment, all patients had a satisfactory evolution [17]. Siegert considers open reduction particularly in patients seen within 4 months after the injury and in whom the carpal articular cartilage is relatively well conserved [13]. Being important characteristics by which the decision was made in this case for not opting for a rescue technique. Takami reports 4 cases of perilunate dislocation with findings of lunate sclerosis (increased moderate in radio density); treated by open reduction and internal fixation with a period total until the establishment of the 18-week treatment with satisfactory results.

Laporte, through a dorsal approach, achieves an adequate reduction and stabilization of the interval scapholunate, triquetrolunate and scaphocapitate with posterior placement of Kirschner pins [19]. Trumble determined the clinical outcome of 22 patients with perilunate dislocations with a average follow-up of 49 months reporting 68% high satisfaction, joining the same job they had before suffering the injury by 45%, concluding that the combination of a dorsal and volar approach and the use of an intraosseous cerclage can effectively restore the normal carpal relationships, providing pain relief, functional movement and strength acceptable grip [19]. The surgical technique presented is supported by the low loss of reduction postoperative period, long-term conservation of carpal structure and low rate of osteoarthritis. It remains to be demonstrated to what extent early mobilization, in combination with a cerclage wire for fixation of ligamentous reconstruction, positively influences the result long- term.

Conclusion

Semilunar dislocations are complex injuries that cause important functional sequelae limiting quality of life. It is important to perform a complete examination of the hand and confirm radiographically to avoid missing this entity. A timely diagnosis helps to have adequate clinical outcomes for the purpose of performing basic life activities. Reconstruction of the chronic pathology of semilunar dislocation and scapholunate ligament (SL) remains a major challenge for hand surgeons. There are several issues that are not have been resolved on when reconstruction rather than repair should be undertaken; however, certain requirements must be met to choose anatomical procedures highlighting the reduction capacity between the interval of the scaphoid, the lunate and the capitate; that there is no significant soft tissue retraction; the absence of radiocarpal osteoarthritis or intercarpal (between the scaphoid, the lunate and the great); or necrotic signs of the dislocated lunate; However, the treatment remains controversial.

References

1. Capo JT, Corti SJ, Shamian B, Nourbakhsh A, Tan V, et al. (2012) Treatment of Dorsal Perilunate Dislocations and Fracture-Dislocations Using a Standardized Protocol. Hand 7(4): 380-387.
2. Dunn AW (1978) Fractures and Dislocations of the Carpus. Surg Clin North Am 52(6): 1513-1538.
3. Green DP, O'Brien ET (1978) Open reduction of carpal dislocations: Indications and operative techniques. The Journal of Hand Surgery 3(3): 250-65.
4. Israel D, Delclaux S, André A, Apredoaei C, Rongières M, et al. (2016) Peri- lunate dislocation and fracture-dislocation of the wrist: Retrospective evaluation of 65 cases. Orthop Traumatol Surg Res 102(3): 351-355.
5. Kara A, Celik H, Seker A, Eray Kilinc, Savas Camur, et al. (2015) Surgical treatment of dorsal perilunate fracture-dislocations and prognostic factors. Int J Surg 24: 57-63.
6. Kim J, Lee J, Park M (2015) Arthroscopic Treatment of Perilunate Dislocations and Fracture Dislocations. J Wrist Surg 04(02): 0817.
7. Martín Ferrero MA (2007) Luxaciones y fracturas-luxaciones perilunares del carpo. Revista de Ortopedia y Traumatología 51: 124-133.
8. Mayfield JK, Johnson RP, Kilcoyne RK (1980) Carpal dislocations: Pathomechanics and progressive perilunar instability. J Hand Surg 5(3): 226-241.
9. Minami A, Kaneda K (1993) Repair and/or reconstruction of scapholunate interosseous ligament in lunate and perilunate dislocations. J Hand Surg 18(6): 1099-1106.
10. Muppavarapu RC, Capo JT (2015) Perilunate Dislocations and Fracture Dislocations. Hand Clinics 31(3): 399-408.
11. Obert L, Loisel F, Jardin E, N. Gasse, Lepage D (2016) High-energy injuries of the wrist. Orthop Traumatol Surg Res 102(1): S81-93.
12. Beltsios M, Sakellariou V, Papagelopoulos P, Savvidou O (2015) Perilunate Dislocations Treated with External Fixation and Percutaneous Pinning. J Wr Surg 04(02): 076-80.
13. Siegert JJ, Frassica FJ, Amadio PC (1988) Treatment of chronic perilunate dislocations. J Hand Surg 13(2): 206-212.
14. Sotereanos DG, Mitsionis GI, Giannakopoulos PN, Tomaino MM, Herndon JE (1997) Perilunate dislocation and fracture dislocation: A critical analysis of the volar-dorsal approach. J Hand Surg 22(1): 49-56.

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15. Subramanian K (2017) Perilunate Dislocation - Case Report and Review of Literature. Journal Of Clinical and Diagnostic Research 11(8): RD06 - RD08.

16. Takami H, Takahashi S, Ando M, Masuda A (1996) Open reduction of chronic lunate and perilunate dislocations. Arc Orth Tr Surg 115(2): 104-107.

17. Campbell Rd Jr, Lance Em, Yeoh Cb (1964) lunate and perilunar dislocations. J Bone Joint Surg Br 46:55-72.

18. Gjeluci A, Raskind A, Dwan B, Yasin L, Allam E (2022) Trans-scaphoid lunate dislocation: A case series. Radiol Cas Repor 17(3): 514-520.

19. Trumble T, Verheyden J (2004) Treatment of isolated perilunate and lunate dislocations with combined dorsal and volar approach and intraosseous cerclage wire. J Hand Surg Am 29(3): 412-417.