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 antebrachial 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].
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 radiotriquetral ligaments, and interrupts the scapholunate joint before interruption of the lunotriquetral 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

Right hand with increased volume, dorsal deformity (Figure 1).
at the along the ulnar edge of the tendon of the flexor carpi radialis muscle; Z-shaped fields on right upper extremity. A volar approach is performed by making a skin incision hypointense on T1, hyperintense on T2 compatible with grade 1 avascular necrosis of the scapholunate ligament and hypointensity data of the lunate on T1 and T2, cysts carpus. MRI of the right wrist with a report of complete rupture of the dorsal component with anteroposterior and lateral projections of the right wrist (Figure 2) with volar nerve territory. Initial QuickDash 70.4° applied. A radiographic study was performed with flexion and extension 15°/20°. Tinel test (+); Durkan (+); Phalen (+) in median with extension. Muscular strength 3/5 Daniels and limitation in the ranges of movement 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

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° surgical use wire. Primary repair of the semilunopyramidal ligament is performed.

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 Kirshner 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 Kirshner 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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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 capitae 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


