Scaphometacarpal Stabilization Technique for Repairable Scapholunate Injury

Técnica de estabilización escafometacarpiana para lesión escafolunar reparable

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Abstract

Despite the numerous techniques (both arthroscopic and open) for the treatment of acute scapholunate instability, there is no consensus on which one results in better healing of the ligaments. In the present work, we describe a new surgical technique to achieve stability of the scaphoid that enables the reduction inflexion and pronation of this bone when dissociation is produced. Using a high-strength suture wire with double cortical button anchor (Mini TightRope, Arthrex, Naples, FL, US, or MicroLink, Conmed, Largo, FL, US) stabilization of the scaphoid is achieved to protect ligament healing without the need for postoperative immobilization.

Keywords
- scapholunate lesion
- dynamic stabilization
- mobilization
- recovery

Resumen

A pesar de las numerosas técnicas (tanto artroscópicas como abiertas) para el tratamiento de la inestabilidad escafolunar aguda, no existe un consenso sobre cuál produce una mejor cicatrización ligamentosa. En este trabajo, presentamos una nueva técnica quirúrgica para conseguir una estabilización escafoidea que permita disminuir la flexión y la pronación del escafoides cuando se produce la disociación. Mediante un cable de sutura de alta resistencia con doble anclaje tipo botón cortical (Mini TightRope, Arthrex, Naples, FL, EEUU, o MicroLink, Conmed, Largo, FL, EEUU), se consigue una estabilización dinámica del escafoides para proteger la cicatrización ligamentosa sin necesidad de inmovilización postoperatoria.

Palabras clave
- lesión escafolunar
- estabilización dinámica
- movilización
- recuperación

Introduction

Scapholunate instability is the most common carpal ligament injury. However, it is a condition with complex etiology, diagnosis, and treatment, which is becoming better understood due to advances in biomechanical studies.[1] For this reason, the surgical treatment of this condition has grown in recent years.[2,3]

Following an acute injury to the scapholunate ligaments, their intrinsic stabilization improves wrist function, reduces symptoms (pain, clicking, loss of strength, limited mobility),

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and delays secondary radiocarpal arthropathy. In line with studies carried out by Corella et al.[4] and Carratalá et al.,[5] minimally-invasive arthroscopic surgery for lesion repair has reduced the rate of complications related to open surgery.

Advances in biomechanical studies highlighted the role of secondary stabilizers of the scapholunate pair. The scaphoid-trapezium-trapezoid (STT) complex is one of the fundamental elements for scaphoid stability and extension.[1] Failure of these components results in the well-known flexion and pronation movement of the scaphoid, triggering the dorsal tilt in dorsal intercalated segment instability (DISI) of the lunate and diastasis of the scapholunate pair.[6] Subsequently, the loss of carpal height and progressive collapse cause pain, loss of mobility, and loss of strength. The sustained instability makes the scapholunate dissociation irreducible, and the surgical solution is less satisfactory.[7]

Classically, after the surgical treatment of a scapholunate injury by shrinkage, reclamping, or ligamentoplasty, immobilization is mandatory to avoid scapholunate mobilization and protect the surgical technique employed. Even though Corrella et al.[4] have published a study describing reduced immobilization times in scapholunate ligamentoplasty, most patients are under postoperative immobilization for no less than four or six weeks.[3]

This immobilization period usually results in a joint stiffness that may not be correctable despite rehabilitation, and can overshadow therapeutic outcomes. In addition, patients often demand a faster return to work and sports practice.

For correct scapholunate stabilization and immediate mobilization, we herein describe a surgical technique for selective dynamic immobilization of the STT joint that reduces the flexion movement of the scaphoid, increasing the chances of proper healing of the primary stabilizers, at the same time that the secondary stabilizers begin to move.

Indications

The indications for this procedure include:

- Acute repair of a scapholunate ligament injury associated with reclamping or shrinkage in chronic, stages I-II Geissler tear;
- Scapholunate ligament injury with scaphoid fractures; and
- Scapholunate ligament injury with a fracture of the distal end of the radius.

Contraindications

- Osteoporosis;
- Chondropathy in the STT joint;
- Injury with growth potential detected during childhood or adolescence; and
- Previous neurovascular or tendon pathology in the wrist.

Surgical anatomy

The scapholunate ligament is considered the most important intrinsic carpal ligament. It stabilizes the articular pair of the scaphoid (proximal pole) and the lunate in continuity, with a "C"-shaped morphology[8] (►**Figure 1**).

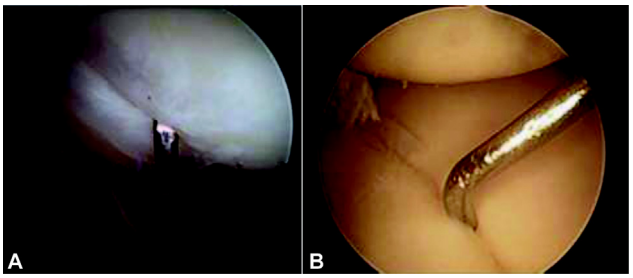

Fig. 1 Arthroscopic anatomy of the scapholunate ligament. Radial (**A**) and midcarpal (**B**) visualization.

It consists of three segments: dorsal, proximal, and volar. The dorsal portion is the thickest ligament bundle (with approximately 3 mm in thickness and 5 mm long), and it accounts for most of the stability. The volar portion is thinner (1 mm) and connected to the palmar radioscaphocapitate extrinsic ligament. Finally, the proximal portion consists of fibrocartilage, with highly-variable thickness.

The scapholunate ligament is considered the primary stabilizer of the scapholunate joint. However, other associated extrinsic ligaments act as secondary stabilizers. The dorsal area contains the radiocarpal (radiotriquetral) and the intercarpal (scaphotriquetral) ligaments, whereas the volar area contains the radioscaphocapitate, long radiolunate, and radioscapholunate ligaments.

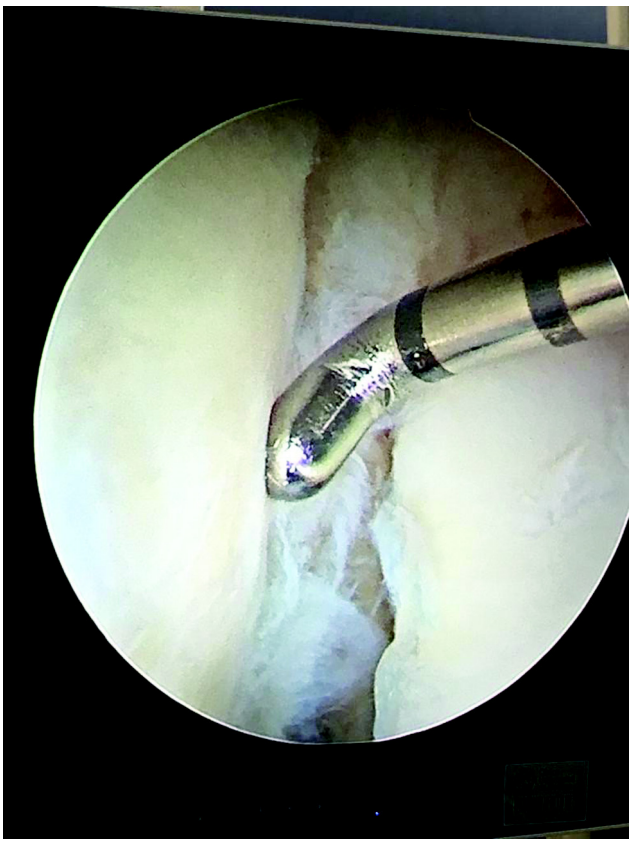

Fig. 2 Arthroscopic image of a Geissler stage-IV scapholunate tear.

Moreover, the intrinsic ligaments of the scaphotrapezoid joint can significantly influence the dorsal stabilization of the scaphoid in case of a scapholunate injury.[9] The dorsal part consists of the trapeziotrapezoid ligament, whereas the palmar part consists of the trapeziotrapezoid, scaphotrapezoidal, capitotrapezial and scaphotrapezial interosseous ligaments; the latter, deemed the most important, is divided into radial and ulnar bundles. In addition, it is accompanied by two ligaments that help joint stability: the trapeziocapitate and the palmar scaphocapitate ligaments.

Although the physical examination and magnetic resonance imaging (MRI) help to establish the diagnosis of scapholunate instability, the definitive diagnosis relies on arthroscopic visualization. The Geissler classification establishes the degrees of dissociation and the surgical protocol for each case.[10]

Repair is indicated in ligaments with stage-II, -III, or -IV injuries. Regardless of the surgical procedure performed, most authors advise fixation of the carpal bones using Kirschner wires, either transscapholunate or transscaphocapitate. The aim is to avoid the dreaded anatomical movement of a dissociated scaphoid, that is, flexion and pronation, with dorsal lunate tilting (DISI) and carpal collapse.

A less aggressive immobilization method, performed after an arthroscopic scapholunate ligamentoplasty, uses splints and orthoses; later, these devices are progressively removed.

Surgical technique

The scaphoid-metacarpal stabilization (SMS) surgical technique is based on a high-resistance suture wire with double cortical button anchoring (Mini TightRope, Arthrex, Naples, FL, US, or MicroLink, Conmed, Largo, FL, US); one button is at the radiopalmar margin of the scaphoid tubercle, and the other is at the ulnar cortex of the base of the third metacarpal bone.

With maximum tension, this wire is placed after the repair of the scapholunate ligament. This dynamic stabilization maintains the height and length of the scaphoid by this vectorized distal and ulnar grip on the third metacarpal bone.

These devices are subject to extra-articular bone points, so they do not produce chondral symptoms; in addition, mobilization is allowed one week after the intervention.

This technique requires an endobutton-type implant:

– Mini TightRope: device formed by a suture cable with high tensile strength. It has two metallic cortical support elements on both sides of the cable.
– MicroLink: device similar to the previous one, but the cortical support elements are not metallic; in addition, it is an all-suture system.

The steps of the surgical technique are as follows:

1. Scapholunate repair after arthroscopic assessment of the injury (thermocoagulation, reclamping, or capsulodesis) (►**Figure 2**).
2. The most distal and radial region of the scaphoid tubercle is the point of origin of the tenodesis. Ensure needle insertion under scope control. This needle has a wire at its base to capture the cable (►**Figure 3**).
3. The needle is directed distally and ulnarly, through the ulnar cortex of the base of the third metacarpal bone, immediately distal to its junction with the fourth metacarpal bone.
4. The suture cable passes through the needle, and the cortical support devices are placed, avoiding damages to the common extensor tendons, and ensuring complete cortical part support (►**Figure 4**).
5. The correct position of the implants is checked using a scope, and the effect achieved is verified through the arthroscopic midcarpal portal.

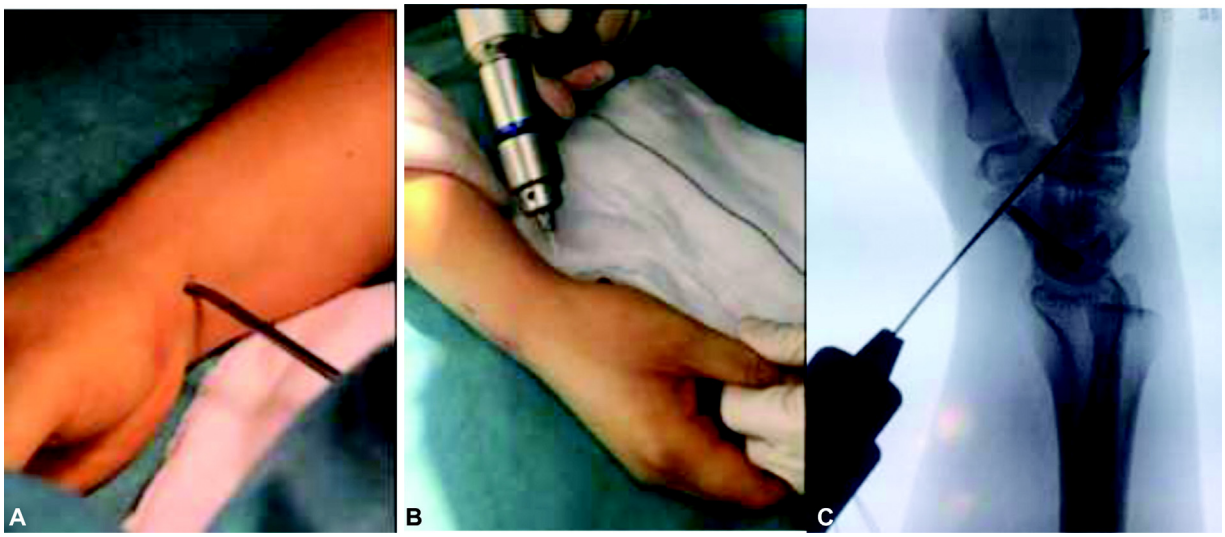

Fig. 3 Dissection of the radial edge of the scaphoid (**A**) and scapho-metacarpal tunneling (**B**) to pass the anchor. Radiological follow-up image (**C**).

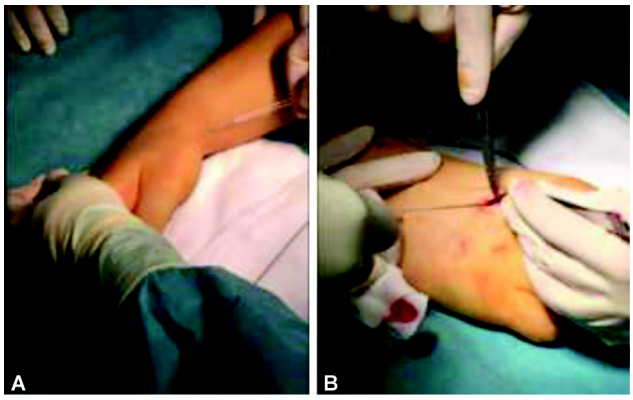

Fig. 4 Insertion of the ortical button anchor (**A**). Dissection of the intermetacarpal space and compression of the metacarpal by the button (**B**).

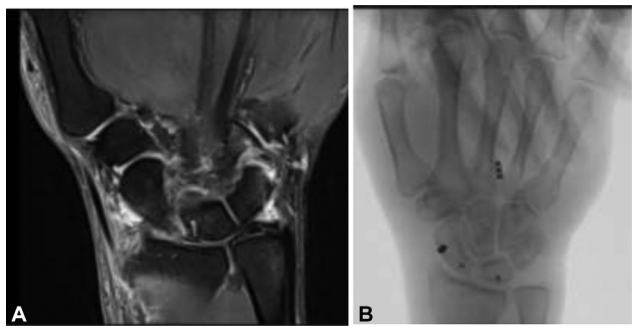

Fig. 5 Patient diagnosed with scapholunate tear (**A**). Double arthroscopic anchorage and scaphometacarpal tenodesis (**B**).

Postoperative period

The patient must wear a wrist bandage after surgery.

The patient is discharged on an outpatient basis, and the first follow-up visit occurs during the first postoperative week. The surgical wound undergoes proper treatment. At home, the patient must follow an active kinesiotherapy protocol for radiocarpal-midcarpal and radioulnar mobility and use a rigid forearm orthosis for daytime and nightly protection.

Before two weeks, the patient is referred to the rehabilitation service for physical therapy.

Hand activity is severely restricted until the third postoperative month, when the scapholunate ligament healing is assessed through an MRI scan.

Next, high-demand activity is allowed.

At this time or later, the cable is excised with or without button removal under local anesthesia if the patient presents limited flexion-extension or deviations due to the high tension of the tenodesis.

Complications

- Irritative synovitis at the extensor digitorum communis due to friction against the metal implant supported by the third metacarpal bone.
- Tension-related wrist symptoms with no observable mobility deficit in a patient requiring implant removal.

Clinical case

A 48-year-old male patient presented a right-wrist trauma after an accidental fall resulting in a diagnosis of scapholunate tear.

Surgical treatment was indicated and performed under axillary plexus anesthesia. The arthroscopic repair used two anchors in a Geissler grade-IV scapholunate tear. Dynamic tenodesis from the scaphoid to the third metacarpal bone was performed under radiological control according to the technique described (►**Figure 5**).

Subsequently, carpal stability was checked through arthroscopy.

The patient received a compression bandage and was discharged after an outpatient procedure.

Protected mobilization with removable orthosis began at 7 days, and rehabilitation started at 4 weeks, when the patient had no pain and presented a full range of joint motion in flexion, extension, pronation, and supination, with 30 kg of force (10 points lower in comparison with the contralateral side) (►**Figure 6**). The score on the Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire was 10. There were no symptoms of peri-implantation, and the clinical maneuvers for scapholunate instability yielded negative results.

A plain radiological study showed stability with no signs of dissociation. An MRI of the wrist three months after the injury confirmed advanced healing of the scapholunate ligament (►**Figure 7**).

The patient requested discharge to return to work after two months, and implant removal has not been proposed due to complete mobility and lack of associated symptoms. A control MRI showed scapholunate healing.

Fig. 6 Mobility at the first postoperative month.

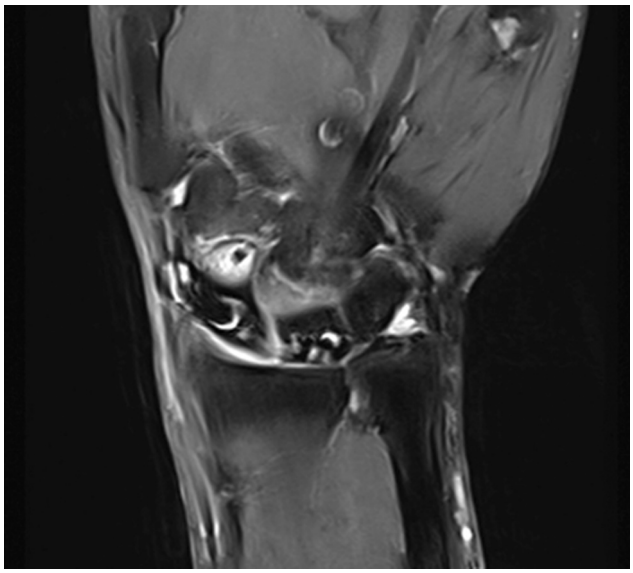

Fig. 7 Control MRI scan at 3 months.

Conflict of Interest

The authors have no conflict of interests to declare.

References

1 Rajan PV, Day CS. Scapholunate Interosseous Ligament Anatomy and Biomechanics. J Hand Surg Am 2015;40(08):1692–1702. Doi: 10.1016/j.jhsa.2015.03.032

2 Geissler WB. Arthroscopic management of scapholunate instability. J Wrist Surg 2013;2(02):129–135. Doi: 10.1055/s-0033-1343354

3 Mathoulin C. Treatment of dynamic scapholunate instability dissociation: Contribution of arthroscopy. Hand Surg Rehabil 2016;35(06):377–392. Doi: 10.1016/j.hansur.2016.09.002

4 Corella F, Del Cerro M, Ocampos M, Larrainzar-Garijo R. Arthroscopic ligamentoplasty of the dorsal and volar portions of the scapholunate ligament. J Hand Surg Am 2013;38(12):2466–2477. Doi: 10.1016/j.jhsa.2013.09.021

5 Carratalá V, Lucas FJ, Miranda I, Prada A, Guisasola E, Miranda FJ. Arthroscopic Reinsertion of Acute Injuries of the Scapholunate Ligament Technique and Results. J Wrist Surg 2020;9(04):328–337. Doi: 10.1055/s-0040-1710502

6 Park I-J, Maniglio M, Shin SS, Lim D, McGarry MH, Lee TQ. Internal Bracing Augmentation for Scapholunate Interosseous Ligament Repair: A Cadaveric Biomechanical Study. J Hand Surg Am 2020;45(10):985.e1–985.e9. Doi: 10.1016/j.jhsa.2020.03.017

7 Luchetti R, Atzei A, Cozzolino R, Fairplay T. Current role of open reconstruction of the scapholunate ligament. J Wrist Surg 2013;2(02):116–125. Doi: 10.1055/s-0033-1343092

8 Kuo CE, Wolfe SW. Scapholunate instability: current concepts in diagnosis and management. J Hand Surg Am 2008;33(06):998–1013. Doi: 10.1016/j.jhsa.2008.04.027

9 Athlani L, Rouizi K, Granero J, et al. Assessment of scapholunate instability with dynamic computed tomography. J Hand Surg Eur Vol 2020;45(04):375–382. Doi: 10.1177/1753193419893890

10 Lee SK, Model Z, Desai H, Hsu P, Paksima N, Dhaliwal G. Association of lesions of the scapholunate interval with arthroscopic grading of scapholunate instability via the geissler classification. J Hand Surg Am 2015;40(06):1083–1087. Doi: 10.1016/j.jhsa.2015.02.017

