Available online at
ScienceDirect
www.sciencedirect.com
Elsevier Masson France
EM|consulte
www.em-consulte.com
Hand Surgery and Rehabilitation xxx (2016) xxx–xxx
Hand Surgery & Rehabilitation

Original article

Treatment of dynamic scapholunate instability dissociation: Contribution of arthroscopy

Traitement des instabilités scapholunaires dynamiques : apport de l'arthroscopie

C. Mathoulin

Institut de la main, clinique Bizet, 23, rue Georges-Bizet, 75116 Paris, France

Received 1st October 2015; received in revised form 23 August 2016; accepted 14 September 2016

Abstract

Scapholunate (SL) ligament injuries generally result from trauma to an extended, supinated wrist, leading to chronic instability that progresses toward osteoarthritis. They can occur together with distal radius fracture. These injuries can be difficult to diagnose, especially early on. Treating chronic SL ligament injuries before the onset of osteoarthritis is still a challenge for surgeons. Until recently, the recommended treatments consisted of open SL ligament reconstruction or repair procedures that reduce pain and improve pinch strength but also lead to wrist stiffness. The introduction of arthroscopy has completely changed our understanding of these injuries and how to treat them. We review here the treatment approach through the eyes of three specific groups of surgeons: the ''pioneers'' who first analyzed these injuries; the ''specialists'' who explored various stabilization techniques to compensate for the torn SL ligament; and the most recent group, the ''anatomists'' who, based on recent arthroscopy findings, sought to reconstruct the anatomical structures as accurately as possible and who developed the concept of the SL complex.

Keywords: Scapholunate ligament; Wrist arthroscopy; Capsuloplasty

Résumé

La lésion du ligament scapholunaire (SL) est la plus fréquemment rencontrée dans les suites d'un traumatisme, le plus souvent en supination et extension du poignet. Elle est génératrice d'instabilité chronique avec une évolution arthrogène. Elle peut être associée à une fracture de l'extrémité distale du radius. Ces lésions sont souvent difficiles à diagnostiquer, surtout au début. Le traitement des lésions chroniques du ligament SL avant l'apparition de l'arthrose reste un challenge pour le chirurgien. Les traitements jusqu'alors recommandés dans la littérature consistaient à réaliser des techniques ouvertes de reconstruction ou de réparation du ligament SL qui peuvent améliorer la douleur et la force de préhension, mais très souvent au prix d'une raideur du poignet. L'avènement de l'arthroscopie a complètement modifié la compréhension et le traitement de ces lésions. Nous proposons de revoir l'approche thérapeutique en séparant trois périodes récentes très particulières : celles des « pionniers » qui les premiers ont analysé cette lésion, celle des « spécialistes » qui ont réfléchi à différentes techniques de stabilisation pour pallier la rupture du ligament SL, et les plus récentes, celle des « reconstructeurs » qui ont plus cherché, suivant les découvertes récentes réalisées grâce à l'arthroscopie, à reconstruire le plus fidèlement possible les éléments anatomiques et ont développé la notion de complexe SL.

Mots clés : Ligament scapholunaire ; Arthroscopie du poignet ; Capsuloplastie

E-mail address: cmathoulin@orange.fr.

http://dx.doi.org/10.1016/j.hansur.2016.09.002
2468-1229/

Please cite this article in press as: Mathoulin C. Treatment of dynamic scapholunate instability dissociation: Contribution of arthroscopy. Hand Surg Rehab (2016), http://dx.doi.org/10.1016/j.hansur.2016.09.002

1. Introduction, anatomical bases

1.1. Anatomy

The scapholunate (SL) complex consists of the intrinsic and extrinsic ligaments (Fig. 1) [1]. The intrinsic portion of the SL interosseous ligament (SLIL) has three segments: dorsal, volar and proximal. The dorsal segment is biomechanically the most important [2]. It is made up of very thick transverse fibers that resist rotation. The volar segment of the SLIL consists of long, oblique fibers that allow sagittal rotation. The proximal segment consists of non-vascularized fibrocartilage that is often perforated secondary to degeneration in the elderly (central perforation of the proximal segment is a common finding on CT arthrography, but since the dorsal and volar segments are still intact, the wrist remains stable). The main extrinsic ligaments of the SL complex are the radioscaphocapitate (RSC) ligament, the long radiolunate (LRL) and short radiolunate (SRL) ligaments, and the dorsal radiocarpal (DRC) and dorsal intercarpal (DIC) ligaments. The impact of these ligaments, also being damaged on SL instability, is not fully understood.

1.2. Ligamentous lesions

As with other human ligaments, the SLIL can be stretched to the point of failure. Mayfield [3] showed that the ligament could extend 225% of its length before it failed. This means that the SLIL can practically double in length before failing.

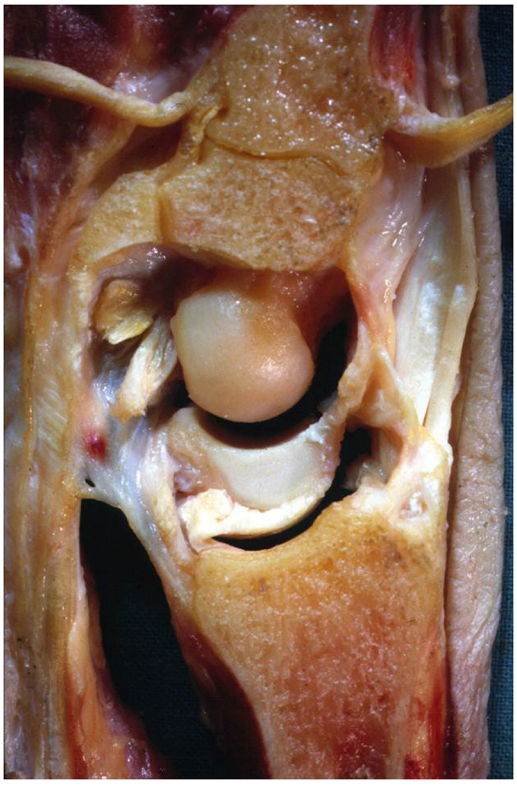

Fig. 1. Lateral view of a fresh cadaver wrist cut through the 2nd metacarpal. The residual portion of the scaphoid was removed and the dorsal and volar radiocarpal and intercarpal ligaments were detached. The scapholunate ligament was cut at its scaphoid attachment; its volar and dorsal ends are linked to the volar and dorsal capsule–ligament elements.

Despite this finding, it appears that the SL complex itself must be injured to cause a pathological condition. Isolated SL ligaments injuries may not lead to SL dissociation on X-rays. On the other hand, slight weakening of the SL ligament that is not visible on X-rays can lead to mechanical problems and pain. Typically, both the intrinsic and extrinsic systems must be damaged for complete SL diastasis to be visible on X-rays. In many cases, radiological abnormalities are not visible immediately after SL ligament injury, but appear over time because of gradual destruction of the extrinsic ligament system. A period of ''dynamic'' instability, which is visible only under certain loading conditions (e.g., tight fist), can be differentiated from ''static'' instability, in which significant bone shifts are often found too late to be repaired if they cannot be reduced. This explains why this pathology is often diagnosed too late.

1.3. Distal pole of scaphoid stabilization [4]

The elements used to stabilize the distal pole of the scaphoid play a nontrivial role, given the loads transmitted by the first (radial) column because of its anterior position. The *flexor carpi radialis* (FCR) complex has both active and passive roles: its osteofibrous canal acts as an anterior buttress superimposed on the scaphoid's distal ligament complex: scaphotrapeziotrapezoid (STT) and scaphocapitate (SC) ligaments.

1.4. Role of the SL interosseous ligament [5]

The scaphoid is linked to the lunate by an interosseous ligament that acts as a torsion bar and provides viscoelastic dampening. This is a heterogeneous structure consisting of three parts:

- the anterior part overlaps with the LRL, SRL and RSC ligaments;
- the proximal part, a non-vascularized fibrocartilaginous membrane, is the area compressed during arthroscopic palpation;
- the strong dorsal part is solidly attached to the dorsal capsule and adjacent to the dorsal scaphotriquetral (ST) ligament and proximal segment of the DIC ligament.

1.5. Summary of anatomical work

From a strictly anatomical point of view, the SL joint is characterized by the juxtaposition of two flat articular facets, resulting in a gliding joint at the proximal pole of the scaphoid and lunate.

The concept of the interosseous ligament itself should be limited to the proximal portion, which is the only non-vascularized fibrocartilaginous portion, and therefore not repairable. Conversely, the volar and dorsal portions of the SL ligament are completely integrated into the extrasynovial volar and dorsal extrinsic ligament systems and have well-developed vascularity (Fig. 2).

Please cite this article in press as: Mathoulin C. Treatment of dynamic scapholunate instability dissociation: Contribution of arthroscopy. Hand Surg Rehab (2016), http://dx.doi.org/10.1016/j.hansur.2016.09.002