Chronic Scapholunate Ligament Injuries
Treatment with Supplemental Fixation

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KEYWORDS

• Scapholunate instability • RASL • SLAM • Reconstruction

KEY POINTS

- Several techniques for supplemental fixation have been described for scapholunate (SL) ligament reconstruction to address concerns of recurrent SL diastasis with other reconstructive procedures.
- Screw fixation with use of RASL (reduction and association of the scaphoid and lunate) screws may allow compression and more rigid fixation.
- There are limited clinical series of outcomes of temporary or permanent screw fixation for SL reconstruction.
- The SL axis method (SLAM) technique places a tendon graft across the SL axis in addition to dorsal reconstruction to allow a stronger construct compared with the modified Brunelli technique.
- For both the RASL and SLAM techniques, it is critical to place SL fixation along the isometric axis of the SL joint to minimize risk of iatrogenic fracture of the scaphoid or lunate and congruent joint reduction.

INTRODUCTION

The management of chronic scapholunate (SL) ligament injuries remains a difficult problem for the treating hand surgeon. Untreated SL dissociation leads to progressive carpal collapse and the development of SL advanced collapse (SLAC) with degeneration of the radiocarpal and midcarpal joints. There is usually inadequate ligament remaining for direct repair in injuries older than 6 to 8 weeks. Despite decades of research and the development of numerous surgical techniques, no single procedure has come forward as being superior in restoring carpal kinematics and maintaining reduction over time. Because of the unpredictable outcomes from chronic SL reconstruction, with a large number of patients developing SL gapping and development of arthritic changes on radiographs, some investigators have advocated limited intercarpal fusion for primary treatment of chronic SL ligament injuries.[1–3]

With most of the described dorsal capsulodeses, the procedure reduces the SL angle but does not directly correct the diastasis. In a series of patients undergoing either Blatt or Mayo dorsal capsulodesis, Moran and colleagues[4] found progressive radiographic deterioration at a mean follow-up of 54 months, with increase in the SL gap from 2.7 to 3.9 mm. Similar progressive diastasis was shown by Pomerance,[5] with an increase in SL gap of 6 mm in high-demand patients with strenuous jobs. The modified Brunelli technique (MBT) is superior biomechanically in maintaining SL angle and preventing SL diastasis with physiologic loading.[6] However, Moran and colleagues[7] found similar improvement in SL angle but progressive SL widening at mean follow-up of 36 months in his series of 15 patients with MBT reconstruction.

In order to improve the reduction and stability of the reconstruction, Ross and colleagues[8] described the scapholunatotriquetral (SLT) tenodesis technique, in which ligament reconstruction

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along the central axis of the SL joint is performed with a tendon graft, in addition to dorsal scapholunate interosseous ligament (SLIL) reconstruction. The SL axis method (SLAM) uses a commercial tendon graft anchor placed into the lunate to perform the central SL stabilization and a tenodesis screw in the scaphoid.

Most SL reconstruction techniques include K-wire fixation across the SL and, sometimes, scaphocapitate joints. However, with pin fixation, there are concerns of inadequate stability of fixation, pin loosening with migration, and pin tract infection. Screw fixation has the advantage of more stable fixation, compression across the SL joint, decreased risk of pin tract infection, and ability to maintain the fixation for a longer period.

This article reviews surgical techniques and the available published literature on supplemental fixation in treatment of chronic SL instability, focusing on open and arthroscopic screw fixation and soft tissue stabilization using the SLAM technique.

PREOPERATIVE PLANNING

Accurate diagnosis of the chronic, static SL injury remains critical when considering the treatment algorithm and supplemental fixation. Acute SL ligament injuries (considered <6 weeks old) can most often be repaired primarily combined with K-wire fixation. In subacute injuries, consideration should be given to high-resolution 3-T MRI to assess the quality of the dorsal SLIL before embarking on surgical repair or reconstruction.

Preoperative radiographs should be obtained and carefully examined for the presence of radiographic changes consistent with arthritis. Radioscaphoid arthritis limited to the radial styloid (stage 1 SLAC) is not a contraindication to the SL reconstruction. This condition is addressed with a simultaneously performed radial styloidectomy to allow better positioning of the screw and tendon reconstruction, as well as to improve radial deviation postoperatively.

Radiographic Imaging

- Neutral posteroanterior (PA), lateral, and oblique views
- PA views in radial and ulnar deviation
- Bilateral pencil-grip PA views
- Comparison films of the contralateral wrist

Indications

- Chronic, static SL instability with widening and dorsal intercalated segment instability deformity that is easily reducible intraoperatively
- Irreparable acute SL injuries
- Chronic SL instability with limited, focal arthritic changes over the radial styloid (stage 1 SLAC)
- Salvage after failed previous ligament repair or reconstruction

Contraindications

- Static SL instability that is not easily reducible
- Advanced radioscaphoid, capitolunate, or arthritic changes

SURGICAL APPROACH

We use a standard open dorsal approach to the wrist with a ligament-sparing dorsal capsulotomy as described by Berger and coleagues.[9] Alternatively, distally based U-shaped capsular flap and T-shaped capsulotomy have been described.

Once the SL interval is identified, close inspection of the articular integrity of the radiocarpal and midcarpal joints should be undertaken. Degenerative changes involving the distal pole of the scaphoid and tip of the radial styloid can be managed with a radial styloidectomy. Patients with extensive radioscaphoid or capitolunate joint degenerative arthritis should be managed with a proximal row carpectomy or limited intercarpal fusion.

SCREW FIXATION OF THE SCAPHOLUNATE JOINT

The use of screw fixation was first described by Rosenwasser and colleagues[10] in the reduction and association of the scaphoid and lunate (RASL) procedure in a 1997 technique article. To address static, irreparable SL instability, an open reassociation of the SL interval using a permanent headless screw was proposed. The key to this procedure is the dechondrification of the SL articulating surfaces to create a fibrous nonunion to maintain long-term reduction and stability. More recently, others have described arthroscopic RASL (ARASL) as a minimally invasive alternative to the open procedure. Larson and colleagues used a temporary screw to augment the soft tissue reconstruction that is removed at 4 months postoperatively.

For screw placement, a second radial column incision is made directly over the first dorsal compartment, starting just proximal to the radial styloid. Branches of the radial sensory nerve are identified, mobilized, and protected. The extensor retinaculum is incised longitudinally with release of the first dorsal compartment. A longitudinal