Acute Scapholunate Ligament Instability

Michael S. Guss, MD,* Wesley H. Bronson, MD,* Michael E. Rettig, MD*

THE PATIENT

A 31-year-old right-hand-dominant male professional dancer felt pain during hyperextension of his right wrist attempting to pick up his dance partner 2 weeks before presentation. He presents with pain and weakness in the right wrist. There is obvious swelling and tenderness dorsally at the scapholunate (SL) interval of the right wrist. His grip strength is measured 20% of the uninvolved side using a hand dynamometer. The scaphoid shift test was too painful to perform. A posteroanterior static wrist radiograph demonstrates an SL interval of 4 mm and a cortical ring sign. The lateral wrist radiograph reveals a radiolunate angle of 30° and an SL angle of 95°.

THE QUESTION

What is the optimal treatment of acute SL ligament injury?

CURRENT OPINION

Garcia-Elias et al proposed 6 stages of SL insufficiency. Acute injuries generally fall into stage II: "complete disruption with repairable ligament."[1] The scapholunate interosseous ligament (SLIL) usually avulses off of the scaphoid. These injuries are amenable to direct repair (using suture anchor or suture through bone tunnels) with or without dorsal capsulodesis.

Scapholunate interosseous ligament injury is usually diagnosed months to years after injury, and many patients do not recall an injury. Dorsal intercalated segment instability (DISI) develops after complete rupture of the SLIL. It may not be apparent initially, perhaps because the scaphotrapezial-trapezoidal and radioscaphocapitate ligaments become more lax with time.[2-4] Dorsal intercalated segment instability due to SLIL injury can cause intermittent pain or snapping, and is associated with the gradual development of SL advanced collapse arthritis, although the natural history of radiographic changes, symptoms, and disability is incompletely understood.[1] Operative treatment of acute and subacute injuries is believed to alleviate symptoms and delay or prevent arthrosis.[5,6] Surgical techniques for acute injuries include closed, arthroscopic-assisted, or open reduction, percutaneous or open screw or wire fixation, and direct repair of the SLIL (with open treatment) with or without dorsal capsulodesis with no consensus on the best method.[7]

THE EVIDENCE

Zarkadas et al surveyed 468 hand surgeons regarding the management of acute and chronic SL instability.[7] Soft tissue procedures were favored for acute cases (97%). More than two-thirds preferred direct repair with (44%) or without (33%) a dorsal capsulodesis. There was tremendous variability in the management of acute injuries (20 different surgical procedures).

Rohman et al compared 82 SLIL injuries (both partial and complete), with 27 treated acutely within 6 weeks of injury. Injuries were divided into isolated (7 acute, 43 chronic) and complex (20 acute, 7 chronic). Complex injuries included any additional ligamentous or bony lesion. Distal radius fractures and triangular fibrocartilage tears were common, and a list of each injury was not provided. Surgical procedures included 16 direct repairs with or without capsulodesis in 6 isolated and 10 complex injuries, 7 Kirschner wire (K-wire) fixations in complex injuries, 3 open reductions in complex injuries, and 1 ligament reconstruction in an isolated SLIL injury. Patients treated within 6 weeks were significantly less likely to have a second procedure (4% to 18%) and showed a nonsignificant trend toward superior radiographic outcomes, determined by a narrower SL gap and a lower SL angle, and a nonsignificant trend to have lower *Quick* Disabilities of the Arm, Shoulder, and Hand scores compared with patients treated after 6 weeks. Forty-three isolated SLIL injuries were chronic and 7 acute. In addition, isolated SLIL injuries were more likely to receive an additional soft

tissue or salvage procedure with late treatment; 9 of 43 were treated in the chronic period versus zero of 7 treated in the acute period. Several complications were listed without much explanation: 2 pin infections, 3 retained guidewire fragments, 3 early pin removals, and 1 migration of an implant.[6]

Bickert et al described 12 patients with complete SLIL ruptures who underwent direct SLIL repair using suture anchors within a mean of 40 days of injury.[8] There were 4 patients with Mayfield stage IV complete perilunate dislocations, 4 with stage III injuries, 2 with stage II injuries, and only 2 with stage I isolated SL ligament ruptures. The results were categorized based on pain, DASH score, and difference of the grip strength to the uninjured side. An average of 19 months after surgery, 8 patients were rated excellent or good, 2 satisfactory, and 2 poor. One patient developed lunate osteonecrosis and one patient rated excellent had SL dissociation radiographically.[8]

Rosati et al performed direct repair using a suture anchor within 21 days of injury for 10 isolated SLIL lesions and 8 SLIL lesions with associated injuries, including scaphoid fracture (4 patients), perilunate dislocation (3 patients), and ulnotriquetral ligament injury (1 patient). Of the 18 patients, 16 had excellent or good Mayo functional outcome scores a mean of 32 months after surgery.[5]

Moran et al described 31 patients with problems ascribed to SL insufficiency (18 classified as dynamic and 13 as static) treated with either Blatt or Mayo dorsal capsulodesis evaluated a minimum of 2 years after surgery.[9] They found no difference between the 2 treatments: both groups had improved pain and decreased flexion.[9]

Minami et al evaluated 12 patients who had SLIL repair (3 within 6 weeks of injury) an average of 5 years after surgery and found that the alignment of the carpus had deteriorated.[10] They later described 17 patients treated with ligamentous repair and Blatt capsulodesis[11] (14 treated within 2 months of injury) and documented maintained SL angles and wrist flexion 70% of the uninjured side.[11]

Pomerance et al evaluated 17 patients an average of 5 years after SLIL repair and capsulodesis for dynamic instability an average of 22 weeks after injury.[12] Of the 8 patients with strenuous jobs, only 3 resumed their preoperative employment without modification.[12]

Gradl et al evaluated 18 patients with operative intra-articular distal radius fractures (DRF) with SLIL injury treated acutely (median 4 d, range 0−30) and compared them with 20 operative DRF patients without a ligament injury an average of 43 months after surgery.[13] The SLIL was repaired using percutaneous K-wire fixation (4 patients), open reduction and K-wire fixation (5 patients), direct ligament repair (2 patients), and direct ligament repair and K-wire fixation (7 patients). Both groups regained an average of more than 80% of range of motion and grip strength compared with the uninjured side. There was no significant difference in pain, Mayo scores, *Quick* Disabilities of the Arm, Shoulder, and Hand scores, SL angle, or SL-interval between groups.[13]

SHORTCOMINGS OF THE EVIDENCE

Relatively few patients are diagnosed with acute SLIL injuries, so most of the evidence addressing direct repair and repair with capsulodesis is in patients with subacute and chronic SLIL insufficiency. Studies of acute injuries are small retrospective case series with limited follow-up that mix partial and complete injuries and isolated injuries with injuries that are part of a more complex pattern. There are no prospective or long-term studies comparing direct repair and direct repair and capsulodesis or any other technique.

DIRECTIONS FOR FUTURE RESEARCH

Randomized prospective trials with long-term follow-up comparing direct repair versus direct repair with capsulodesis in the acute setting would determine if there are any differences in short- and long-term symptoms, disability, and arthrosis. Studies should separate isolated SLIL injuries from SLIL injuries with perilunate injury. Partial and complete SLIL injuries should also be studied separately. A minimum 10-year follow-up with radiographs will be necessary to characterize the natural history of acute SLIL instability treated nonoperatively or treated with a surgical repair including changes in the SL interval, SL angle, and radiolunate angle, and the development of arthrosis.

OUR CURRENT CONCEPTS FOR THIS PATIENT

Patients with SLIL injury have fewer symptoms, less disability, more motion, and better radiographic alignment when they have operative treatment within 6 weeks of injury compared with when they are treated later.[5,6] Unfortunately, most patients present with subacute or chronic injuries.

Our patient's history, examination, and radiographs are consistent with a complete acute SL rupture, likely Garcia-Elias stage II. We offered the patient operative repair to limit wrist pain and snapping episodes in the near term and to limit arthrosis in

the longer term. Because the patient places substantial demands on the wrist, he chose operative treatment.

We prefer to augment direct repair of the SL ligament with a modified dorsal intercarpal ligament (DIC) capsulodesis because we do not believe that the repair will heal sufficiently to maintain both the coronal and sagittal plane deformities. We use a dorsal approach at the SL interval with transverse dorsal capsulotomy proximal to the DIC and distal to the radiolunotriquetral ligament. The scaphoid and lunate are realigned using 0.062-inch K-wires placed in the scaphoid and lunate and used as joysticks. Several 0.045-inch K-wires are placed transversely from the scaphoid into the lunate and from the scaphoid into the capitate to maintain alignment and are buried. Alternatively, a temporary screw can be placed from the scaphoid into the lunate, although we find this more technically demanding. We use suture anchors to repair the SL ligament. The proximal half of the DIC is mobilized, rotated, and sutured to the dorsal scaphoid and dorsal lunate. The K-wires are removed 8 to 10 weeks later in the operating room. Evidence to date suggests that patients should be advised to expect loss of range of motion, especially in flexion.

REFERENCES

1. Garcia-Elias M, Lluch AL, Stanley JK. Three-ligament tenodesis for the treatment of scapholunate dissociation: indications and surgical technique. *J Hand Surg Am*. 2006;31(1):125–134.
2. Short WH, Werner FW, Green JK, Masaoka S. Biomechanical evaluation of the ligamentous stabilizers of the scaphoid and lunate: Part II. *J Hand Surg Am*. 2005;30(1):24–34.
3. Short WH, Werner FW, Green JK, Masaoka S. Biomechanical evaluation of ligamentous stabilizers of the scaphoid and lunate. *J Hand Surg Am*. 2002;27(6):991–1002.
4. Mitsuyasu H, Patterson RM, Shah MA, Buford WL, Iwamoto Y, Viegas SF. The role of the dorsal intercarpal ligament in dynamic and static scapholunate instability. *J Hand Surg Am*. 2004;29(2):279–288.
5. Rosati M, Parchi P, Cacianti M, Poggetti A, Lisanti M. Treatment of acute scapholunate ligament injuries with bone anchor. *Musculoskelet Surg*. 2010;94(1):25–32.
6. Rohman EM, Agel J, Putnam MD, Adams JE. Scapholunate interosseous ligament injuries: a retrospective review of treatment and outcomes in 82 wrists. *J Hand Surg Am*. 2014;39(10):2020–2026.
7. Zarkadas PC, Gropper PT, White NJ, Perey BH. A survey of the surgical management of acute and chronic scapholunate instability. *J Hand Surg Am*. 2004;29(5):848–857.
8. Bickert B, Sauerbier M, Germann G. Scapholunate ligament repair using the Mitek bone anchor. *J Hand Surg Br*. 2000;25(2):188–192.
9. Moran SL, Cooney WP, Berger RA, Strickland J. Capsulodesis for the treatment of chronic scapholunate instability. *J Hand Surg Am*. 2005;30(1):16–23.
10. Minami A, Kaneda K. Repair and/or reconstruction of scapholunate interosseous ligament in lunate and perilunate dislocations. *J Hand Surg Am*. 1993;18(6):1099–1106.
11. Minami A, Kato H, Iwasaki N. Treatment of scapholunate dissociation: ligamentous repair associated with modified dorsal capsulodesis. *Hand Surg*. 2003;8(1):1–6.
12. Pomerance J. Outcome after repair of the scapholunate interosseous ligament and dorsal capsulodesis for dynamic scapholunate instability due to trauma. *J Hand Surg Am*. 2006;31(8):1380–1386.
13. Gradl G, Pillukat T, Fuchsberger T, Knobe M, Ring D, Prommersberger KJ. The functional outcome of acute scapholunate ligament repair in patients with intraarticular distal radius fractures treated by internal fixation. *Arch Orthop Trauma Surg*. 2013;133(9):1281–1287.