Journal of Hand Surgery Global Online 5 (2023) 467–470

Contents lists available at ScienceDirect

Journal of Hand Surgery Global Online

journal homepage: www.JHSGO.org

Case Report

Volar Scapholunate Interosseous Ligament Reconstruction in Acute Traumatic Wrist: A Review of Volar-Based Repairs/Reconstructions

Olivia Means, MD, * Matthew Fahrenkopf, MD †

* Integrated Plastic Surgery Residency, Corewell Health/Michigan State University (formerly Spectrum Health), Grand Rapids, MI
† Elite Hand and Plastic Surgery Center, Grand Rapids, MI

ARTICLE INFO

Article history:
Received for publication March 28, 2023
Accepted in revised form March 29, 2023
Available online April 24, 2023

Key words:
Ligament
Reconstruction
Scapholunate
Traumatic wrist
Volar

The volar scapholunate interosseous ligament is an important stabilizer of the wrist. In 2015, van Kampen et al described the technique for reconstruction of an isolated palmar injury using a long radiolunate ligament in the subacute or chronic setting; however, its use has not been described in the acute, traumatic setting. We describe the use of their technique in a 22-year-old man who presented with a traumatic right open transradiocarpal disarticulation with underlying bony, tendinous, ligamentous, and neurovascular injuries secondary to a motor vehicle accident. At 3 months after surgery, the patient had improved range of motion, no pain, normal scapholunate angle at 59.6°, and no scapholunate gap.

The scapholunate interosseous ligament is an important stabilizer of the wrist. It is a C-shaped structure, with dorsal, proximal, and volar components. The dorsal component is the strongest portion and contributes to stability with flexion and extension. The volar component contributes to rotational stability.[1] There are fewer repair and reconstruction techniques for volar injuries compared with their dorsal counterparts.

In this study, we report a case of a traumatic wrist disarticulation, with associated volar scapholunate interosseous ligament injury that was successfully treated using a strip of a long radiolunate ligament. We subsequently present a review of volar scapholunate interosseous ligament repair techniques and outcomes.

Case Report

A 22-year-old male right handed baseball player presented with a traumatic right open transradiocarpal wrist disarticulation with underlying bony, tendinous, ligamentous, and neurovascular injuries secondary to a motor vehicle accident. The volar scapholunate ligament was found to be completely disrupted at the time of surgery with appreciable gapping (Fig. 1). As described by van Kampen et al[2], the long radiolunate ligament was identified. An L-shaped incision was made within the ligament, releasing the radial attachment, and then extending the cut in line with the transverse fibers, dividing the ligament in half. The scapholunate joint was manually reduced under direct visualization. The strip of long radiolunate was rotated distally toward the scaphoid, tensioned, and attached to the proximal pole of the scaphoid with a suture anchor (mini Mitek suture anchor, DePuy Synthes).[2] The short radiolunate ligament was repaired with a second suture anchor. The radioscaphocapitate ligament was primarily repaired. The remainder of the volar capsule was then repaired (Fig. 2).

Intraoperative repair also included a six-strand repair in an M-tang fashion of flexor pollicis longus, flexor digitorum superficialis to the index and middle fingers, flexor carpi radialis, extensor pollicis brevis, and abductor pollicis longus. The lacerated median nerve was trimmed back to healthy fascicular architecture, mobilized, primarily repaired without undue tension, and wrapped with a nerve protector (Axogen Nerve Protector, Axogen Inc).

After surgery, he was placed into a dorsal-blocking splint to protect the repairs. A Duran protocol was followed for his flexor tendon rehabilitation.[3,4] At 3 months after surgery, he had good functional use of the wrist, hand, and fingers with an advancing Tinel test sign at the distal palmar crease. He was discharged from therapy 6 months following the injury. At that time, he was

Declaration of interests: No benefits in any form have been received or will be received related directly to this article.

Corresponding author: Olivia Means, MD, Integrated Plastic Surgery Residency, Corewell Health/Michigan State University (formerly Spectrum Health), 100 Michigan St NE, Suite A601, Grand Rapids, MI 49503.
E-mail addresses: olivia.means@corewellhealth.org, olivia.means@spectrumhealth.org (O. Means).

https://doi.org/10.1016/j.jhsg.2023.03.015

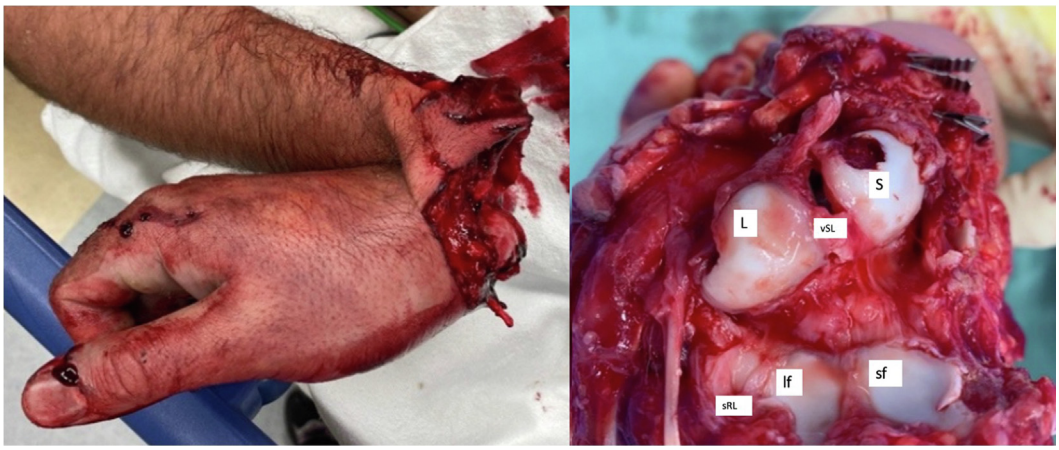

Figure 1. Clinical appearance of the wrist at the time of injury. S; scaphoid, L; lunate, vSL; volar scapholunate ligament, sRL; short radiolunate ligament, sf; scaphoid fossa, lf; lunate fossa.

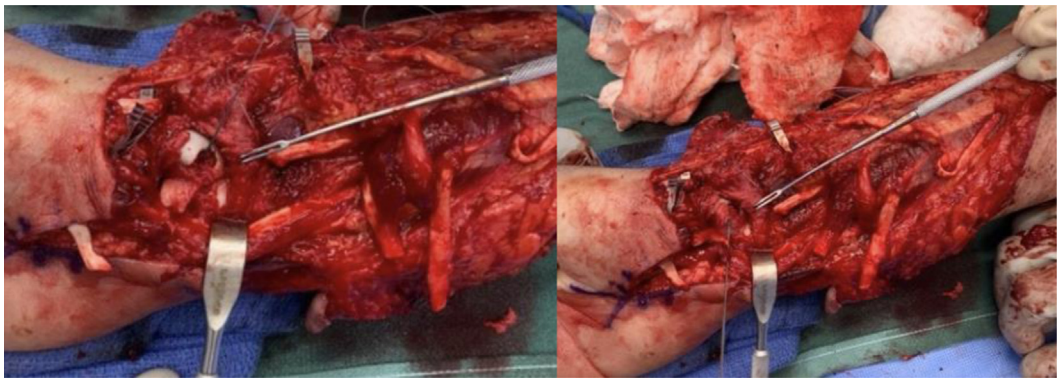

Figure 2. Intraoperative volar ligament repair.

throwing a baseball with the injured hand and swinging a baseball bat. He had protective sensation returning to the fingertips and no pain in the hand or wrist.

Discussion

A literature review was conducted using the PubMed and MEDLINE databases to obtain data on volar-only scapholunate interosseous ligament reconstructions. The search strategy included published articles in English with the key words “volar,” “scapholunate,” and “ligament.” Combined searches yielded 130 abstracts. All articles were reviewed and evaluated for appropriateness by the senior author (M.P.F.).

Four articles were included in the final analysis. These studies described a surgical technique for volar-only scapholunate interosseous ligament repair/reconstruction. The volar scapholunate ligament was repaired/reconstructed using volar capsuloplasty augmented with free tendon graft ($n = 31$), volar reefing of the capsule and long radiolunate ligament ($n = 4$), volar capsuloplasty ($n = 8$), or a strip of the long radiolunate ligament ($n = 1$).

Hyrkas et al[5] described using the palmaris or radial flexor muscle tendon as a free tendon graft. The tendon graft is passed through a bony channel created in the distal radius metaphysis oriented in an oblique, proximal to distal direction.[5] In 2011, del Piñal et al[6] described using a Tuohy needle and an absorbable suture to create a knot with the remnant of the torn scapholunate (SL) ligament and long radiolunate ligament to close the SL gap. In 2013, del Piñal[7] further described how this technique can be used to repair volar defects of the scapholunate ligament, lunotriquetral ligament, or the space of Poirier. This technique does require remnant ligaments amenable to suture.[7] In 2015, van Kampen et al[2] described the technique for reconstruction of an isolated palmar injury using a long radiolunate ligament in the subacute or chronic setting. Using this repair, the authors noted adequate strength of the ligament without compromising vascular supply to the scaphoid or lunate.[2]

Postoperative data were available for 26 of 44 patients. Average follow-up was at least 34 months. In total, 25 of 26 patients had flexion and extension arcs greater than or equal to 75% of the uninjured side. Only one patient reported severe wrist pain. In addition, 17 of 26 patients resumed their activity level comparable with before surgery (Table 1).[2,5–7] These techniques are not without challenges and complications. The arthroscopic approach requires additional technical skill to secure the knot needed for the repair, avoid damage to the palmar cutaneous branch of the median nerve, and entrapment of the flexor pollicis longus tendon.[6,7] van Kampen et al[2] cautioned against using their long radiolunate ligament repair technique in the setting of dorsal intercalated segment instability. In this injury, the hyperflexed position of the scaphoid may compromise the long radiolunate.[2] Despite their limited number of patients, Hyrkas et al[5] and van Kampen et al[2] reported promising outcomes regarding pain, range and motion, and return to activity following repair.

Our patient had pain and range of motion outcomes comparable with the available literature. The surgical technique used in his case

Table 1
Volar Scapholunate Interosseous Ligament Repair Study Outcomes

Author	Repair technique	No. of patients	Average follow-up	Flexion/extension arc	Pain	Activity
Hyrkas et al[5]	Volar capsuloplasty augmented with free tendon graft	31 patients operated on, 25 with follow-up data	34 mo (3.5–86 mo)	24-arc > 75% 1-arc < 75%	8-pain free, 5-occasional pain, 12-disturbing pain, 0-debilitating pain	16-same as before surgery, 4-somewhat impaired activity, 3-impaired
del Piñal et al[6]	Volar reefing of the volar capsule and long radiolunate ligament	4	Insufficient data for follow up analysis	N/A	N/A	N/A
del Piñal[7]	Volar capsuloplasty	8	N/A	N/A	N/A	N/A
van Kampen et al[2]	Strip of long radiolunate ligament	1	36 mo	Flexion 60° Extension 70°	No pain	Same as before surgery

Table 2
Three-Month Postsurgical Therapy Results

	Injured (right)	Uninjured (left)
Wrist flexion	65°	75°
Wrist extension	20°	70°
Radial deviation	15°	20°
Ulnar deviation	10°	35°
Pronation	70°	70°
Supination	70°	85°
Grip Strength	7 kg	40 kg
Scaphoid shift test		
- Clunk (Y/N)	N	N
- Pain (Y/N)	N	N
SL angle	59.6°	55.1°
SL gap	<2 mm	<2 mm
Pain (Y/N)	N	N
Scar	Present, adherent	None
Sensation (2-point discrimination)	+Tinel at the distal palmar crease	
- Median	- 5 mm	- 5 mm
- Ulnar	–	- 5 mm

Figure 3. On radiographic analysis at 3 months, patient has no SL gap and normal SL angle at 59.6°.

was chosen because of the ease of visualization of the long radiolunate ligament given his injury and not needing arthroscopy. At 3 months after surgery, he had improved range of motion in the wrist and fingers (Table 2). Pronation and supination were near equivalent compared with the uninjured wrist (Table 2). On radiographic analysis, the patient had normal SL angle at 59.6° and no SL gap (Fig. 3). He had no pain in the wrist at the time of his 6-month follow-up. The patient recovered functional use of the hand to throw a baseball and swing a baseball bat.

Although fewer in number, there are repair techniques for isolated volar scapholunate interosseous ligament injuries. These results appear promising with the limited data available. More studies are needed to better understand long-term functional outcomes among individual techniques. Surgeons should

familiarize themselves with the differing options to appropriately care for patients with these isolated volar injuries. Their application in chronic wrist pain and scapholunate instability can be translated to acute injuries in the traumatic hand.

Patient Consent: Written informed consent was obtained from the patient for publication of this case report and accompanying images.

References

1. Sokolow C, Saffar P. Anatomy and histology of the scapholunate ligament. *Hand Clin*. 2001;17(1):77–81.
2. van Kampen RJ, Bayne CO, Moran SL. A new technique for volar capsulodesis for isolated palmar scapholunate interosseous ligament injuries: a cadaveric study and case report. *J Wrist Surg*. 2015;4(4):239–245.
3. Duran R, Houser R, Coleman C, et al. A preliminary report in the use of controlled passive motion following flexor tendon repair in zones II and III. *J Hand Surg Am*. 1976;1:79.
4. Starr HM, Snoddy M, Hammond KE, Seiler JG III. Flexor tendon repair rehabilitation protocols: a systematic review. *J Hand Surg Am*. 2013;38(9):1712-7.e14.
5. Hyrkas J, Antti-Poika I, Virkki LM, Ogino D, Konttinen YT. New operative technique for treatment of arthroscopically-confirmed injury to the scapholunate ligament by volar capsuloplasty augmented with a free tendon graft. *Scand J Plast Reconstr Surg Hand Surg*. 2008;42(5):260–266.
6. del Piñal F, Studer A, Thams C, Glasberg A. An all-inside technique for arthroscopic suturing of the volar scapholunate ligament. *J Hand Surg Am*. 2011;36(12):2044–2046.
7. del Piñal F. Arthroscopic volar capsuloligamentous repair. *J Wrist Surg*. 2013;2(2):126–128.