Scapholunate Ligament Reconstruction

FRONTIERS IN UPPER EXTREMITY SURGERY
BRANDON EARP, MD
BRIGHAM AND WOMEN’S HOSPITAL
BOSTON, MA
NOVEMBER 5, 2016

Disclosures
- I have stock ownership in Johnson and Johnson and Pfizer.

Overview
- Anatomy and biomechanics
- Acute injury
- Chronic instability
- Late degenerative changes - SLAC
<table>
<thead>
<tr>
<th>Overview- SL Ligament Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stage 1: Partial scapholunate ligament injury</td>
</tr>
<tr>
<td>• Stage 2: Complete disruption with repairable ligament</td>
</tr>
<tr>
<td>• Stage 3: Complete disruption with irreparable ligament but normal alignment</td>
</tr>
<tr>
<td>• Stage 4: Complete disruption with irreparable ligament and reducible rotary subluxation of the scaphoid</td>
</tr>
<tr>
<td>• Stage 5: Complete disruption with irreducible malalignment and intact cartilage</td>
</tr>
<tr>
<td>• Stage 6: Chronic SLIL disruption with cartilage loss (SLAC)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When can/should you reconstruct?</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Wrist X-rays" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Stage 1: Partial scapholunate ligament injury</td>
</tr>
<tr>
<td>• Stage 2: Complete disruption with repairable ligament</td>
</tr>
<tr>
<td>• Stage 3: Complete disruption with irreparable ligament but normal alignment</td>
</tr>
<tr>
<td>• Stage 4: Complete disruption with irreparable ligament and reducible rotary subluxation of the scaphoid</td>
</tr>
<tr>
<td>• Stage 5: Complete disruption with irreducible malalignment and intact cartilage</td>
</tr>
<tr>
<td>• Stage 6: Chronic SLIL disruption with cartilage loss (SLAC)</td>
</tr>
</tbody>
</table>
Overview

- Stage 1: Partial scapholunate ligament injury
- Stage 2: Complete disruption with repairable ligament
- Stage 3: Complete disruption with irreparable ligament but normal alignment
- Stage 4: Complete disruption with irreparable ligament and reducible rotary subluxation of the scaphoid
- Stage 5: Complete disruption with irreducible malalignment and intact cartilage
- Stage 6: Chronic SLIL disruption with cartilage loss (SLAC)

SLAC Wrist

- Scapho-Lunate Advanced Collapse
  - Natural history of untreated chronic scapholunate dissociation
  - Progressive arthritis

Early: Repair +/- capsulodesis
SLAC Wrist

Stage I

Stage II

Stage III

Stage IV

SLAC Treatment

- Stage 1:
  - Arthroscopy
  - Radial Styloidectomy
  - PIN Neurectomy

- Stage 2:
  - Proximal row carpectomy (PRC)
  - Scaphoid excision/four corner fusion
  - Scaphoid excision and Capitolunate fusion
SLAC Treatment

• Stage 1:
  - Arthroscopy
  - Radial Styloidectomy
  - PIN Neurectomy

• Stage 2:
  - Proximal row carpectomy (PRC)
  - Scaphoid excision/four corner fusion
  - Scaphoid excision and Capito-lunate fusion

• Stage 3:
  - Scaphoid excision/four corner fusion
  - Scaphoid excision and Capito-lunate fusion

• Stage IV:
  - Total wrist fusion
  - Total wrist arthroplasty
SLAC Treatment

- Stage IV:
  - Total wrist fusion
  - Total wrist arthroplasty

When can you reconstruct?

- Complete ligament disruption with either:
  - Normal alignment
  - Static SL widening
  - Reducible DISI
  - No arthritic change

Workup

- Xrays
- Stress Xrays
- MRI
Workup

- X-rays
- Stress X-rays
- MRI

Treatment

- Non-op management
  - Limited role
  - May alleviate symptoms but will not correct the rotational deformity of the scaphoid

- Will lead to osteoarthritis over variable time frame
Surgical Reconstruction

- Key is to reduce the flexed scaphoid
  - Restore ‘normal’ anatomy and kinematics
- Replicate the anatomy of the SLIL complex while preserving wrist motion and maintain this long-term to avoid future SLAC
- Many options exist; still seeking something “great”

Dorsal capsulodesis

- Blatt
  - Flap of wrist capsule is kept attached to the radius proximally and inserted onto the dorsal distal pole of the scaphoid
Dorsal capsulodesis

- **Blatt**
  - Keeps scaphoid from subluxating palmarly and corrects scaphoid flexion
  - Fails to address SL diastasis
  - Significantly decreases wrist ROM

Dorsal capsulodesis

- **Dorsal intercarpal capsulodesis (Mayo)**
  - Flap of dorsal IC ligament left attached to distal scaphoid and elevated off triquetrum and then mobilized proximally and attached to lunate. Scaphoid is taken out of flexion before reattachment.
Dorsal capsulodesis

- Dorsal intercarpal capsulodesis (Mayo)
  - does not tether the scaphoid to the distal radius
  - may permit closure of the scapholunate gap without restricting wrist motion

Surgical Reconstruction

Bone-Retinaculum(Ligament)-Bone Graft

- block of bone from area of Lister’s obtained with intact overlying periosteum and retinaculum.
- Inset into groove made in SL interval after removing central bone, leaving only a periosteum/retinaculum “bridge” intact.
Surgical Reconstruction

Bone-Retinaculum(Ligament)-Bone Graft
- Also described for bone-ligament-bone from base of 2nd or 3rd metacarpals
- Indicated for Stage 3 (normal alignment with complete SL tear)

SL reconstruction

• Brunelli Technique(s)
  - Strip (1/2) of distally-based FCR brought volar-dorsal through distal scaphoid tunnel, then attached to lunate
SL reconstruction

- Brunelli Technique(s)
  - Corrects scaphoid flexion +/- SL widening
  - Somewhat better flexion than capsulodesis

Surgical Reconstruction

- RASL (reduction and association of the scaphoid and lunate)
  - Headless compression screw inserted across a reduced SL interval

- In addition there are innumerable modifications to these techniques, but basically most are variations on capsulodesis or tenodesis.

- Range of motion can be reasonably expected to be 60–80 % of the contralateral side, with more flexion loss; grip strength averages 65–90 % of the contralateral side.
SL Reconstruction

- **Interosseous Reconstruction with tendon autograft**
  - Dorsal approach
  - Joysticks placed into scaphoid and lunate to expose the SL joint
  - Matching tunnels drilled in scaphoid (uni) and lunate (bi)
  - Tendon (2mm wide, 10+cm long strip of PL, radial wrist extensor) graft "dunked" along with a nonabsorbable suture tape into scaphoid and secured with anchor
  - Graft and tape brought through lunate tunnel and out dorsal lunate

---

SL Reconstruction

- **Interosseous Reconstruction with tendon autograft**
  - SL interval reduced and anchor inserted into dorsal lunate tunnel securing the graft/tape reconstruction
  - Third tunnel made in distal scaphoid
  - Tendon and graft "dunked" into scaphoid tunnel and secured with anchor after appropriate scaphoid extension is achieved
  - Scaphocapitate pin placed (6-8wks)
Summary

- Wrist kinematics is complex
  - Scaphoid flexes
  - Triquetrum extends
  - Lunate follows
- SL dissociation involves intrinsic (SLIL) and extrinsic (RSC) injuries

Summary

- Early treatment is better
- Acute injuries
  - Reduction and pinning
  - Ligament repair
- Late degenerative state (SLAC)
  - Proximal row carpectomy
  - Scaphoid excision and intercarpal fusion
  - Total wrist fusion
Summary

- Between these two phases, SL reconstruction is appropriate for complete chronic tears with reducible deformity without arthritis.

Thank you