Scapholunate Dissociation

Dr. Bajammal
Dr. Burrow
Oct 11, 2006 Grand Rounds
Outline

- Facts
- Anatomy
- Kinematics
- Clinical Presentation
- Diagnosis
- Treatment
Facts about SL dissociation

- The most common acute and chronic wrist ligament injuries
- To avoid missed diagnosis, needs to know anatomy, kinematics and patterns of injury
- 25% delayed diagnosis because “sprained” wrist
- If missed $\rightarrow$ predicted pattern of disability (SLAC wrist, Scapholunate Advanced Collapse)
Anatomy

• Osseous

• Ligamentous:
  – Extrinsic (Capsular): dorsal and palmar
  – Intrinsic (Interosseous)

• Muscles:
  – No motor attachment to carpal bones except FCU into Pisiform
Extrinsic (Capsular) Ligaments

Palmar Ligaments

Dorsal Ligaments
Intrinsic (Interosseous)

- SL: thicker dorsally
  - 300N failure force

- LT: thicker palmarly
SL (thicker dorsally!)
Kinematics

• 150º flexion-extension:
  – 60% of flexion from mid-carpal
  – 60% of extension from radiocarpal

• 50º radioulnar deviation:
  – 60% from mid-carpal
Kinematics Theories

• Row Theory:
  – proximal and distal rows linked by scaphoid

• Column Theory:
  – 3 columns: radial, central and ulnar

• Oval-ring Theory:
  – 4 parts: distal row, scaphoid, lunate & triquetrum
Kinematics

• Proximal row has no direct tendinous attachment
  – Its motion directed by flexors and extensors attached to metacarpals
  – Described as **INTERCALATED SEGMENT**

• Scaphoid has tendency to flex
  – Because of the push through trapezium and capitate

• Triquetrum has tendency to extend
  – Because of the helicoid articulation with hamate

• Lunate is balanced between scaphoid and triquetrum by intact SL and LT ligaments
Kinematics

• As the wrist moves from radial to ulnar deviation, the entire proximal row extends
  – 20° relative movement between scaphoid, lunate, and triquetrum with full wrist motion

• If SL disrupts: triquetrum and lunate extend (DISI); scaphoid flexes

• If LT disrupts: triquetrum extends; scaphoid and lunate flex (VISI)
Take home message #1

When the SL disrupts, triquetrum & lunate extend (DISI) and scaphoid flexes
Classification of Carpal Instability
Larsen et al, *J Hand Surg* 1995

1. Chronicity:
   - acute (< 1wk), subacute (1-6 wk), chronic (> 6wk)

2. Constancy:
   - Predynamic, dynamic, static reducible & static irreducible

3. Location:
   - Radiocarpal, Proximal and Distal Intercarpal, Midcarpal, Carpometacarpal
Classification of Carpal Instability
Larsen et al, *J Hand Surg* 1995

4. Etiology: Traumatic, Non-traumatic

5. Direction: DISI, VISI, ulnar translation, dorsal translation

6. Pattern: Dissociate vs. Nondissociative; Mayo Clinic Classification
Mayo Clinic Classification

- **CID (carpal instability dissociative):**
  - Disruption within a row; e.g., SL or LT disruptions

- **CIND (carpal instability nondissociative):**
  - Disruption between rows; e.g., mid-carpal instability

- **CIC (carpal instability complex):**
  - Features of CID & CIND; Lesser Arc and Greater Arc

- **CIA (carpal instability adaptive):**
  - Extrinsic to wrist; e.g., Mal-union of distal radius
Progressive Perilunate Instability
(Mayfield)
Clinical Presentation

• History:
  – Axial compression-hyperextension injury
  – Acute: diffuse swelling, non-specific tenderness
  – Subacute & chronic: pain, weakness, giving way, clunk, snap, or click with use

• Examination: bilateral
  – Tenderness
  – Watson’s test: from ulnar to radial deviation, pressure over volar aspect of scaphoid
    • Pain or audible clunk; false +ve 30%
Watson Test
D/D of Radial Sided Wrist Pain

- SL Dissociation
- Perilunate wrist instability
- Scaphoid fracture
- Scaphotrapezial arthritis
- Radioscaphoid arthritis
- de Quervain’s tenosynovitis
- Dorsal wrist impaction syndrome
- Dorsal ganglion cyst
X-ray signs of Static SL Disruption
PA Wrist X-ray

1. SL gap >3mm suspicious, >5mm diagnostic (Terry-Thomas sign)

2. Scaphoid ring sign: scaphoid flexed, tuberosity superimposed on the waist
   - Distance between proximal edge of the ring to the ulnar corner of the scaphoid is <7mm

3. Triangular shaped lunate (extended)

4. Reduction in carpal height ratio (<0.54)

5. Disruption of Gilula’s lines
Gilula’s Lines
X-ray signs of Static SL Disruption
Lateral Wrist X-ray

1. SL angle > 60° probable, >80° definite
2. Lunate extended, DISI pattern
3. Lunocapitate angle > 15°
4. V sign
DISI

[Diagram showing bone structures and angles]

> 80°
> 30°
If suspecting SL disruption

• Negative routine x-rays $\Rightarrow$ rule out dynamic instability:
  1. Stress x-rays
     • Ulnar deviation PA view
     • AP clenched-fist view
  2. Arthrogram
  3. MR Arthrogram (3 compartments)
     • RC, MC, DRUJ
  4. Arthroscopy: gold standard
Geissler Arthroscopic Classification

• Grade I:
  – Attenuation of SL ligament seen from radiocarpal space
  – No mid-carpal step-off
  – Thumb spica splint or cast 6-8 weeks

• Grade II:
  – Attenuation seen from radiocarpal joint
  – Incongruency between the scaphoid and lunate is seen from the mid-carpal joint
  – Arthroscopic-assisted SL pinning for 6-8 weeks
Geissler Arthroscopic Classification

• Grade III:
  – A small 1-mm probe passes between carpal bones
  – Normal SL angles
  – Open repair

• Grade IV (Static):
  – A 2.7-mm arthroscope passes between carpal bones
  – SL gap ≥3 mm; SL angle >70°
  – Open repair + capsulodesis
Treatment
Acute SL Dissociation

• Geissler I (Pre-dynamic):
  – Thumb spica splint or cast 6-8 weeks

• Geissler II → arthroscopic-assisted K-wire

• Geissler III & IV → Open repair:
  – Dorsal midline incision, 3rd & 4th
  – K-wire joystick for reduction
  – Drill holes or suture anchors
  – 2-3 K wires across SL; then tie sutures
  – K-wires for 8-10 wk; additional 4-6 wk no WB
  – With or without capsulodesis (Blatt, DIC)
Direct Repair of SL ligament
Blatt Dorsal Capsulodesis

A

Dorsal flap  Notch

B

Pullout suture
DIC Capsulodesis
Subacute & Chronic SLD
Subacute & Chronic Reducible SLD
Without Arthritis

1. Open repair: if enough lig to repair

2. Capsulodesis: control scaphoid flexion
   – Blatt is most common

3. Tenodesis: re-establish SL relationship
   – e.g., Brunelli
Brunelli Technique of Tenodesis
Subacute & Chronic Reducible SLD Without Arthritis

1. Open repair: if enough lig to repair

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3. Tenodesis: re-establish SL relationship
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4. Bone-Ligament-Bone Reconstruction
Bone-Ligament-Bone graft
Subacute & Chronic Reducible SLD
Without Arthritis

1. Open repair: if enough lig to repair
2. Capsulodesis: control scaphoid flexion
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3. Tenodesis: re-establish SL relationship
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4. Bone-Ligament-Bone Reconstruction
5. Arthrodesis:
   – STT (triscaphe), scaphocapitate
   – SL fusion: highest rate of non-union
STT Fusion
(Scaphoid-Trapezium-Trapezoid)
Chronic SLD with Arthritis
SLAC Wrist

Stage I

Stage II

Stage III
SLAC Stage I

- Radial styloidectomy & STT fusion
Options for SLAC Stage II

- Four corner fusion & scaphoid excision
- Proximal row carpectomy
Options for SLAC Stage III

- Four corner fusion & scaphoid excision
- Wrist fusion
- Can’t do Proximal row carpectomy b/c capitate arthritic
Thanks