

CARPAL INSTABILITY

Ligaments

Intrinsic

Scapho-lunate ligament: Dorsal component stronger than volar ligament

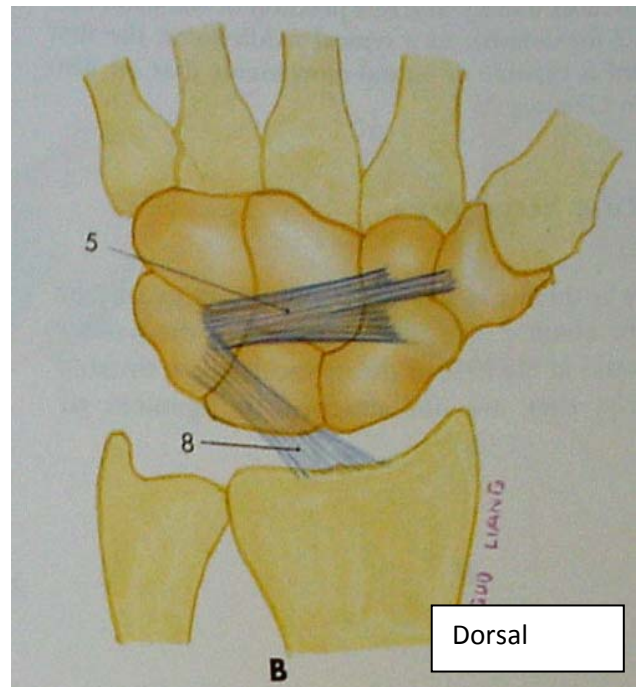
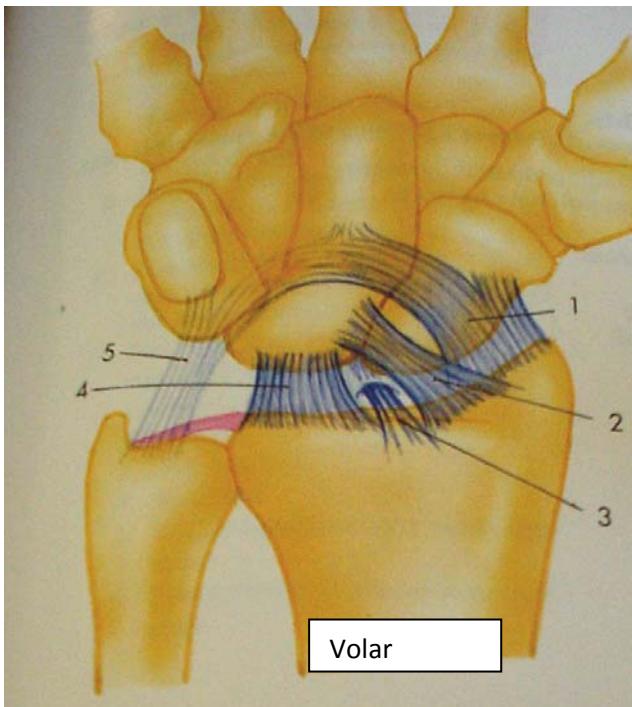
Luno-triquetral ligament: Volar component stronger than dorsal ligament

Extrinsic

- Palmar**
- 1 Radio-scapho-capitate ligament
 - 2,4 Long and Short Radio-lunate ligament
 3. Ulno-lunate, Ulno-triquetral ligament
 5. Ulno-capitate ligament

Poirier: Between RSC & LRL

- Dorsal**
8. Dorsal radio carpal ligament
 5. Dorsal intercarpal ligament



Scapho-lunate interosseous ligament [SL ligament]

C shaped structure 3 parts:

1. Dorsal [3 mm thick, transverse fibers]
2. Proximal [thin fibrocart and blends with radio-Scapho-lunate ligament]
3. Volar [1 mm and oblique]

Dorsal is bulky and important. Division of SLIL causes DISI [Dorsal intercalated segmental instability].

Load Transmission	Scaphoid- 60% and Lunate	40%
	Scaphoid-trapezium-trapezoid	23%
	Scapho-capitate	28%
	Luno-capitate	29%
	Triquetro-hamate	20%

Theories

I Row Theory

Proximal Row is connected by interosseous ligament and moves independently from distal row.
Scaphoid tends to flex on radial deviation

II Column Theory [Navarro 3 longitudinal columns]

Central: Flex and Extend (Lunate, Capitate, Hamate)

Lateral: Mobile (Scaphoid, Trapezium, Trapezoid)

Medial: Rotation (Triquetrum, Pisiform)

III Teleisnik theory

Scaphoid is stabilizing link

Trapezium and Trapezoid is added to the central column.

Triquetrum is the pivot for rotation

Type of instability

A. Static Dissociate (intrinsic ligament)

VISI [volar intercalated segmental instability]

DISI [Dorsal intercalated segmental instability]

B. Static Non-Dissociative (Extrinsic ligament) ie., CIND

Dorsal carpal subluxation

Midcarpal instability

Volar carpal instability

C. Dynamic instability

D. Adaptive carpal instability (Following Colle's or; Barton's fracture)

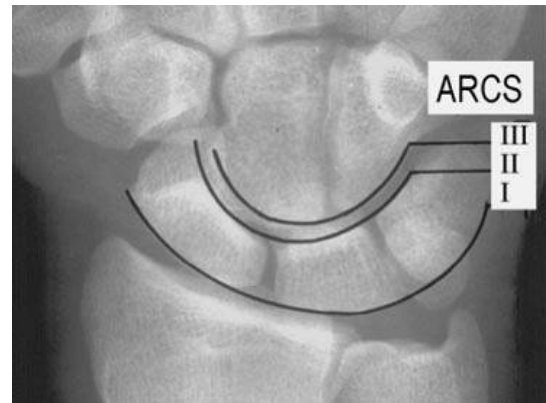
Mechanism

Isolated ligamentous injury

Perilunate dislocation

Displaced Scaphoid injury

Malunited colle's fracture



Any fall with extension, ulnar deviation of the wrist and intercarpal supination (landing on Thenar eminence) can cause ligamentous disruption. This occurs sequentially, with failure initiated on the radial aspect, then around lunate and lastly at the ulnar side.

DISI

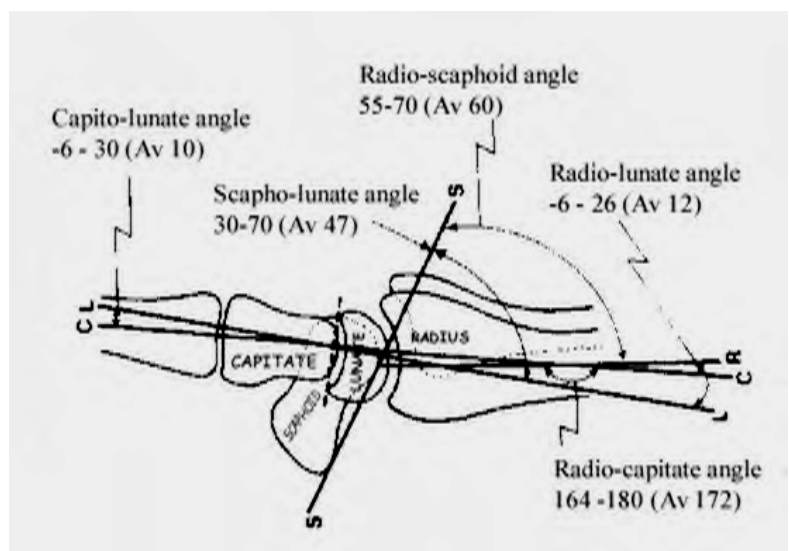
Symptoms

Pain: Radial side DISI

Ulnar side VISI

Grip strength: may be weak

Painful clicks on wrist movement



Signs

- Localizing tenderness
- Ballotable tests
- Kirk Watson test

X rays

- PA in Neutral, Ulnar deviation, Radial deviation
- Lateral in neutral, flexion, extension
- PA= neutral clenched fist

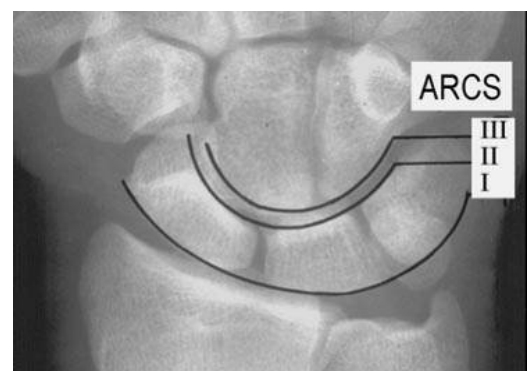
Radiological signs

Terry Thomas	> 3mm
Cortical ring sign	7 mm from the proximal pole
Lunate	Trapezoid shaped Lunate
Scapholunate angle	45° Normal >70 ° means DISI <30 ° VISI
Lunocapitate angle	0-10 ° [>30 in DISI]



Other imaging

- Image Intensifier: EUA
- Arthrogram
- Radiocarpal and midcarpal +/-MRI is very useful
- MRI: Gadolinium has become gold standard
- Bone Scan:** Localise. Not required as a routine
- Arthroscopy:** Presently: is very popular



Scapho-Lunate ligament stretches by 100% before rupture.

Giessler's Classification

Grade I Attenuation of interosseous ligament;

No midcarpal step off

Treatment: cast for 6 wks

II Mid carpal step off.

Treatment: Reduce and K wire

III Complete separation demonstrated from Radiocarpal and Midcarpal

1 mm probe can be passed between scaphoid and lunate

Treatment: Repair and K wire

IV As in III and 2.7 scope can be passed easily

Open repair and capsulodesis

Principle of treatment

Acute Dynamic Splint

Does not require repair

Acute static Early open repair of Scapho-lunate ligament and K wire

1. Open repair

Dorsal Approach

Use K wires as a Joy stick into the Scaphoid and lunate and reduce

Initial fixation is radius to ulna with a K wire

Then fix Scaphoid to radius

The scapholunate ligament which usually ruptures from Scaphoid is repaired to Scaphoid with a bony stitch

Above elbow thumb spika for 8 wks

2. Blatt's Capsulodesis

This procedure is indicated only when the rotation of the scaphoid can be reduced

Dorsal approach

Elevate 1 cm flap of the capsule with intact attachment proximally to radius

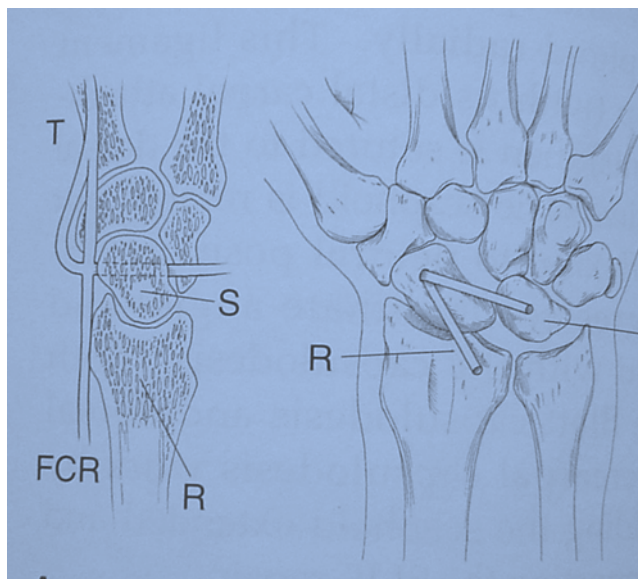
Reduce the volar flexed scaphoid

Transfix the scaphoid to the capitate

Fix the flap of the capsule to the distal part of the scaphoid (Prevents volar flexion of scaphoid). Drill hole from dorsal to volar and tie it over a button

3. Brunelli reconstruction

FCR tendon left intact distally and is divided proximally. The split tendon is passed from volar to dorsal at the distal Scaphoid. Attached to distal radius [original Brunelli] or to the dorsal lunate



4. STT fusion with a radial styloidectomy

Indication: When Scaphoid rotation is fixed.

STT fusion is always combined with radial styloidectomy

Disadvantages 50% of Flexion-Extension is lost

30% Non-union, Early wrist arthritis.

Treatment of SLAC

Proximal row carpectomy

4 corner fusion

VISI

Ligament between Lunate and triquetrum is C shaped and the palmar region is the thickest

The "balanced lunate" concept

S-L ligament influences volar tilt of Lunate

L-T ligament influences dorsal tilt of Lunate

X ray

Look for scapholunate relation

[A=Normal; B =DISI, C =VISI]

A, Break in Gilula's arcs 1 and 2

B, Lateral radiograph S-L angle in lateral: $<30^\circ$

C. Luno-capitate: Zigzag $>15^\circ$

D. Luno-triquetral: N 16°

Key elements on a normal PA view.

- (1) The carpal bones form three smooth arcs;
- (2) carpal bones are separated by a 1- to 2- mm space;
- (3) scaphoid has an elongated shape;
- (4) radius has an ulnar inclination of 15 to 25 degrees;
- (5) radial styloid projects 8 to 18 mm (average 13 mm).

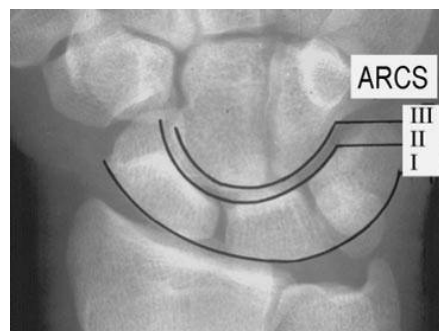
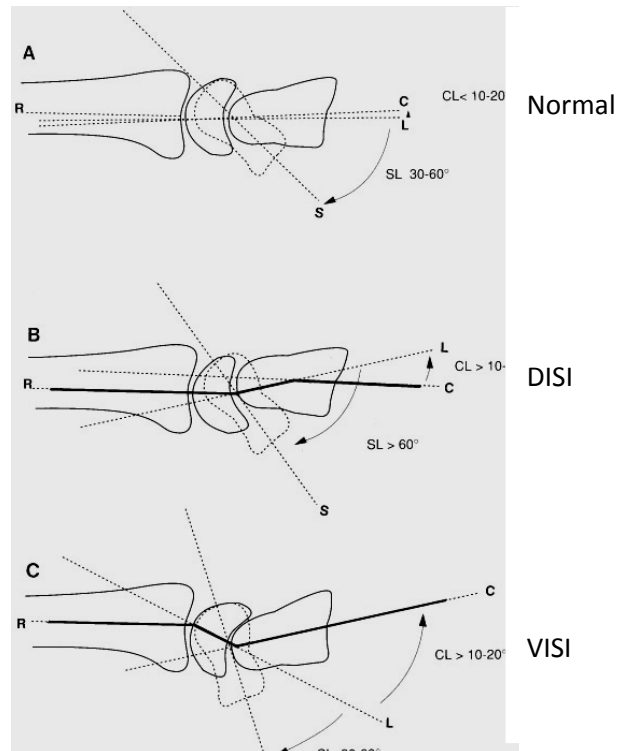
Volar intercalated segment instability (VISI).

The lunate tilts palmar

The capitolunate angle increases

The scapholunate angle is maintained.

The zigzag pattern is in the opposite direction.



Clinical

Fall on the dorsiflexed wrist with a hypothenar contact point

Symptoms are usually

- Diminished wrist motion and weakness

- A sensation of instability or giving way

- The ulnar nerve paraesthesiae

- A painful wrist clunk with deviation is often present.

Diagnoses

1. Arthrography : Been replaced by MRI
2. Videofluoroscopy : "clunk" that occurs with deviation.
3. Bone scanning can be useful in identifying the site of acute injury
4. Selective midcarpal injection of local anesthetic
5. Wrist arthroscopy: gold standard

Treatment

VISI less understood than DISI

Options include Corticosteroid injection

- Immobilization

- Ligament repair

- Ligament reconstruction with tendon grafts,

- Limited intercarpal arthrodesis: L-T arthrodesis [50% non-union]

- Ulnar shortening

- Total wrist arthrodesis

CIND

DISI and VISI can occur without damage to interosseous ligament injury

Described by Dobyn's.

MIDCARPAL CIND

Usually ulnar sided wrist pain

Test: like that of TFCC, when moved the wrist from radial to ulnar side, a click and pain

Fluoroscopy and movement

MRI: Synovitis of midcarpal joint

Pathology: volar or dorsal subluxation of capitate occur due to weakness in the

Dorsal carpal or Palmar radioscaphocapitate ligament

Rx: Capsular reefing Or limited arthrodesis

ULNAR TRANSLOCATION

Translocation of carpal bones common in rheumatoid and can be treated by isolated Chamay's radio-lunate fusion in selected cases. Otherwise: wrist arthrodesis or proximal carpal row excision

Causes for ulnar side pain

1. Non-union of ulnar carpal and metacarpal bones

Ulnar styloid: NU

2. Ligament: VISI

TFCC

3. Ulnar impaction syndrome

4. Lunatomalacia [Keinbocks's]

5. IRUJ dislocation or subluxation

6. Tumors like: intraosseous ganglion

7. Vascular and nerve: Guyon's canal entrapment

Thrombosis of ulnar syndrome [Hypothenar hammer syndrome]

8. Tendinitis: FCU and ECU

9. Various osteoarthritis

10. Ulnar styloid: NU

11. Carpometacarpal boss

Assessment

Hand examination with tests of ligament stability [Clinical examination of the Hand]

Imaging

X ray

CT: Fracture which is not clear on X rays; CT is a preferred. Eg., hook of Hamate or IRUJ subluxation

Arthrography

MRI: TFCC tear. Brighter in T2 due to fluid

Arthroscopy

Fluroscopy

Bone scan