

**Scapholunate Ligament Reconstruction**

FRONTIERS IN UPPER EXTREMITY SURGERY

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BOSTON, MA

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Disclosures

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

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Overview

- Anatomy and biomechanics
- Acute injury
- Chronic instability
- Late degenerative changes - SLAC

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### Overview- SL Ligament Injuries

- 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)

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### When can/should you reconstruct?



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### Overview

- Stage 1: Partial scapholunate ligament injury
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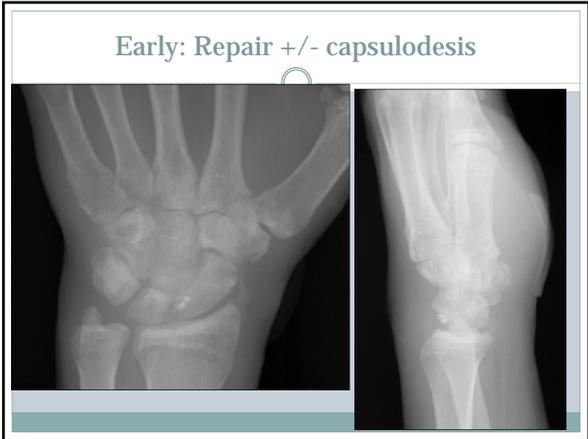
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Overview

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SLAC Wrist

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

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SLAC wrist

- Stage I



A lateral radiograph of a wrist showing Stage I SLAC (Scapholunate Dissociation). The scaphoid and lunate bones are visible, with a subtle gap between them. A small circle is positioned above the text 'Stage I'.

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SLAC Wrist

Stage I      Stage II



Two lateral radiographs of a wrist. The left image shows Stage I SLAC with a small gap between the scaphoid and lunate. The right image shows Stage II SLAC with a more pronounced gap and some sclerosis at the joint surface. A small circle is positioned above the text 'Stage II'.

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SLAC Wrist

Stage I      Stage II      Stage III



Three lateral radiographs of a wrist showing the progression of SLAC. Stage I shows a small gap. Stage II shows a larger gap. Stage III shows a complete dissociation of the scaphoid and lunate, with an arrow pointing to the gap and an asterisk marking the scaphoid. A small circle is positioned above the text 'Stage II'.

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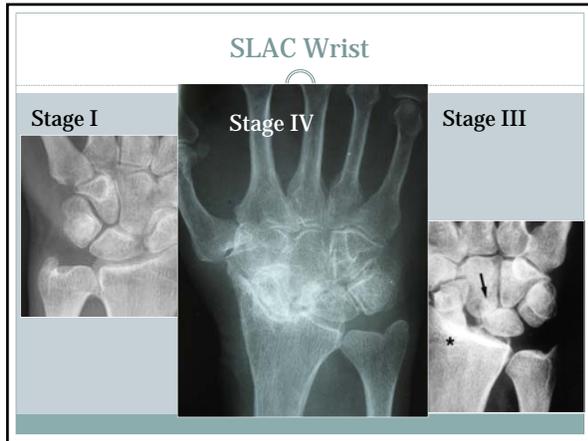
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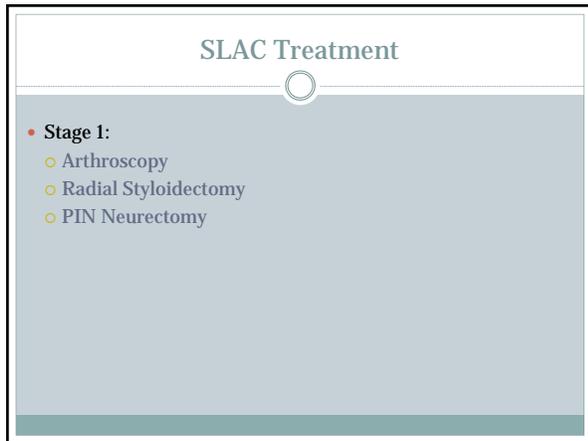
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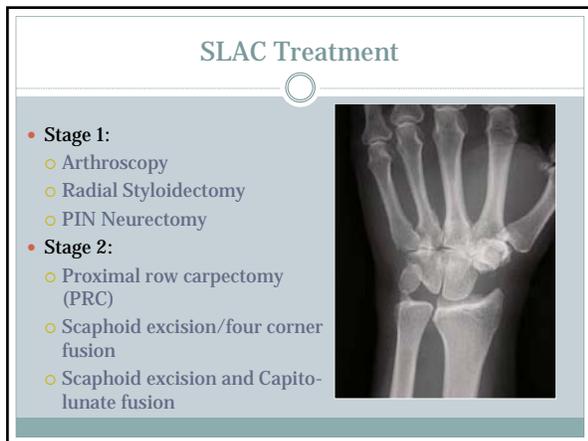
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### SLAC Treatment

- Stage 1:
  - Arthroscopy
  - Radial Styloidectomy
  - PIN Neurectomy
- Stage 2:
  - Proximal row carpectomy (PRC)
  - Scaphoid excision/four corner fusion
  - Scaphoid excision and Capito-lunate fusion



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### SLAC Treatment

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



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### SLAC Treatment

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



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### SLAC Treatment

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



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### When can you reconstruct?



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

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### Workup

- Xrays
- Stress Xrays
- MRI



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**Workup**

- Xrays
- **Stress Xrays**
- MRI



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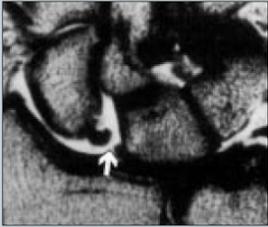
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**Workup**

- Xrays
- **Stress Xrays**
- **MRI**



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**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**

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### 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"

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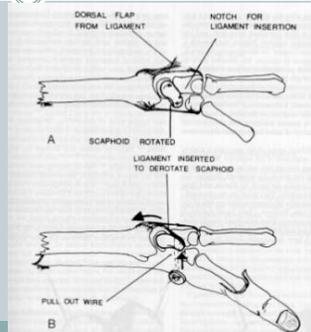
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### Dorsal capsulodesis

- **Blatt**
  - flap of wrist capsule is kept attached to the radius proximally and inserted onto the dorsal distal pole of the scaphoid



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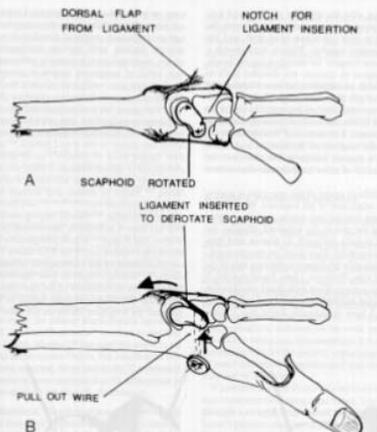
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### Dorsal capsulodesis

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

DORSAL FLAP FROM LIGAMENT      NOTCH FOR LIGAMENT INSERTION

A      SCAPHOID ROTATED  
LIGAMENT INSERTED TO DEROTATE SCAPHOID

B      PULL OUT WIRE

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### 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.

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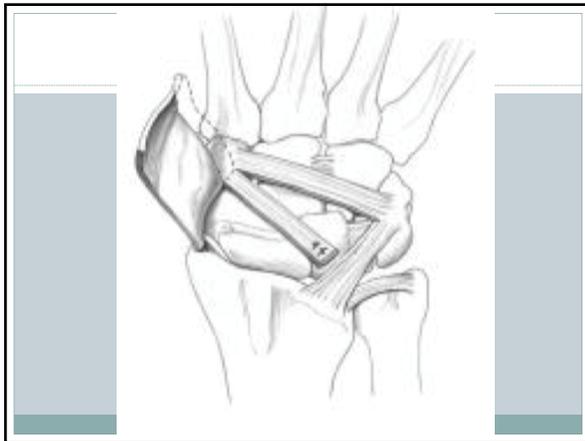
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### Dorsal capsulodesis

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




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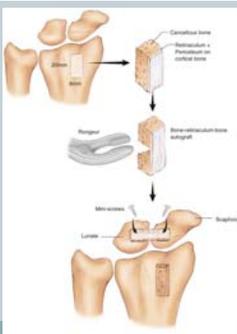
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### Surgical Reconstruction

#### 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.




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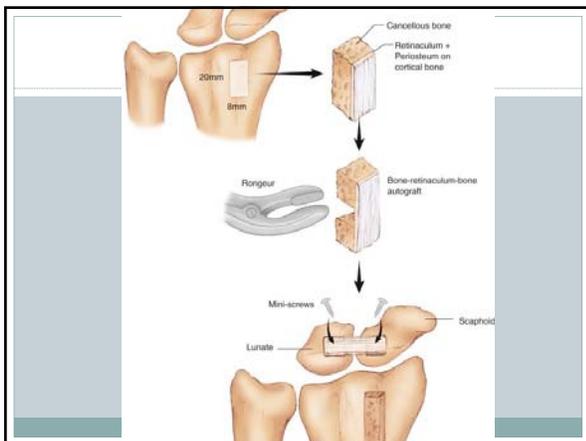
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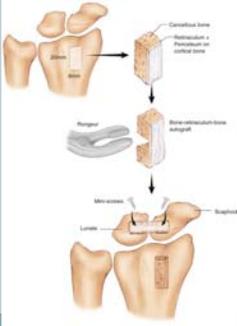
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### Surgical Reconstruction

**Bone-Retinaculum(Ligament)-Bone Graft**

- Also described for bone-ligament-bone from base of 2<sup>nd</sup> or 3<sup>rd</sup> metacarpals
- Indicated for Stage 3 (normal alignment with complete SL tear)



The diagram illustrates the Bone-Retinaculum-Ligament-Bone (BRLB) graft procedure. It shows the harvest of a bone graft from the base of a metacarpal (labeled 'Metacarpal'). The graft is then prepared as a 'Bone-retinaculum-bone autograft'. This autograft is implanted into the wrist joint, positioned between the scaphoid and lunate bones, to reconstruct the scapholunate ligament. Labels include 'Carpal bone', 'Metacarpal', 'Bone-retinaculum-bone autograft', 'Metacarpal', 'Lunate', and 'Scaphoid'.

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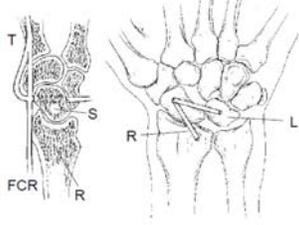
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### SL reconstruction

**Brunelli Technique(s)**

- Strip (1/2) of distally-based FCR brought volar-dorsal through distal scaphoid tunnel, then attached to lunate



The diagram illustrates the Brunelli technique for SL reconstruction. It shows a strip of the distally-based Flexor Carpi Radialis (FCR) tendon being passed through a tunnel in the distal scaphoid (S) and then attached to the lunate (L). Labels include 'T' (trapezoid), 'S' (scaphoid), 'R' (radial styloid), 'L' (lunate), and 'FCR'.

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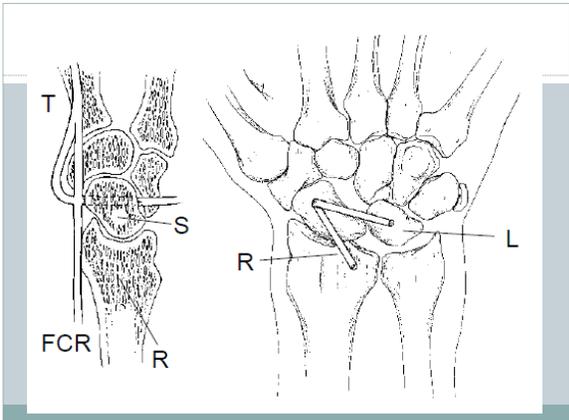
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This diagram provides a more detailed view of the Brunelli technique. It shows the FCR tendon strip being passed through the distal scaphoid tunnel (S) and attached to the lunate (L). Labels include 'T' (trapezoid), 'S' (scaphoid), 'R' (radial styloid), 'L' (lunate), and 'FCR'.

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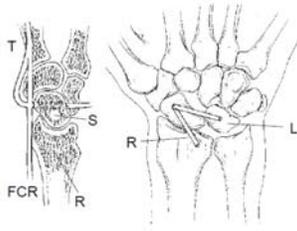
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### SL reconstruction

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




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### Surgical Reconstruction

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




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### SL Reconstruction

- 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.

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### 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



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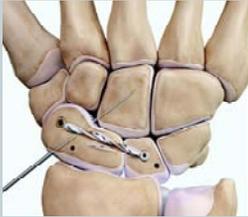
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### SL Reconstruction

- **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)



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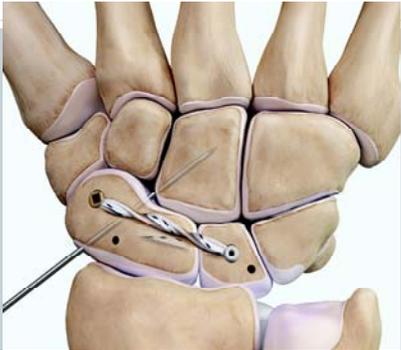
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### SL Reconstruction



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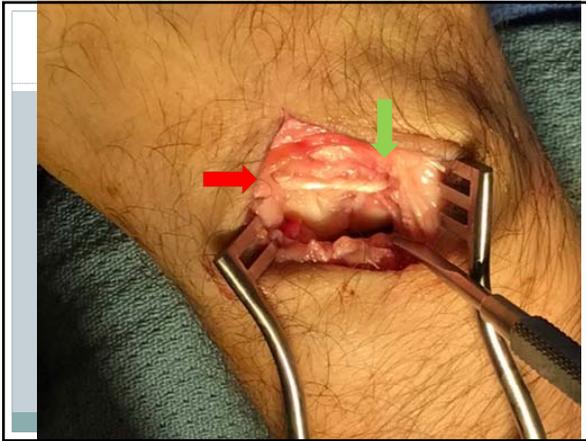
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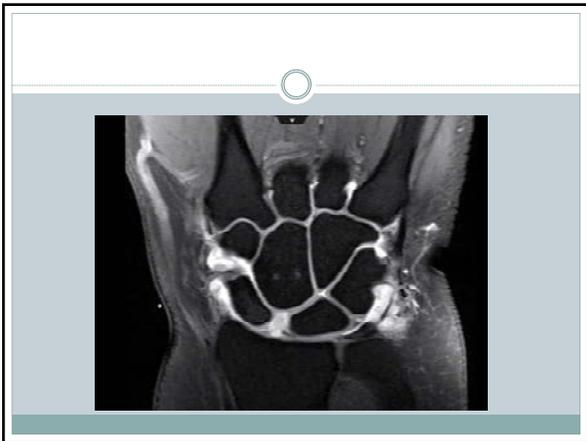
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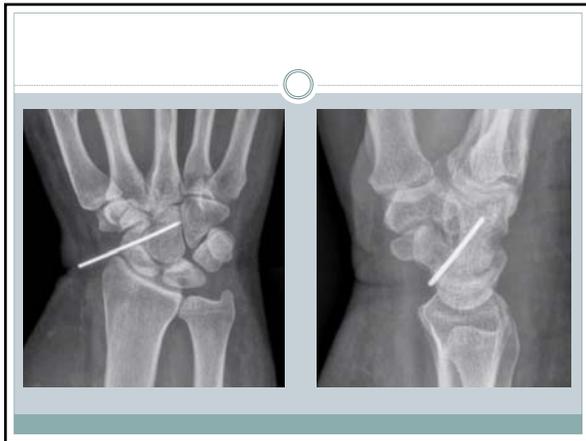
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Summary

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

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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

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### Summary

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

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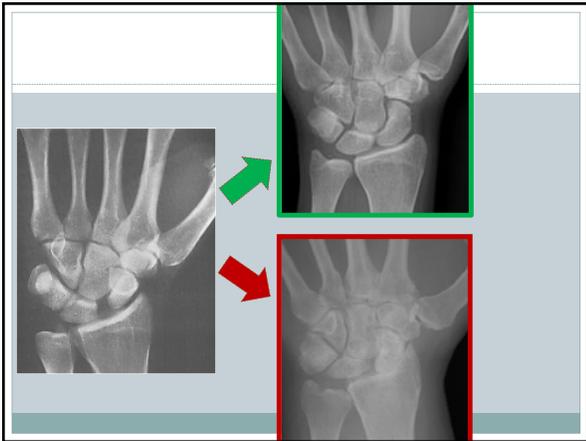
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Thank you

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