

Exploring Hand Therapy Manual

Wrist Secrets The Occupational Therapist's Approach Part 2



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Wrist Secrets: Part 2 The Occupational Therapists Approach

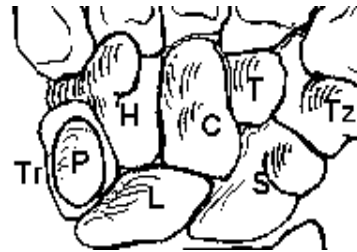
Susan Weiss

This Section is designed

- To enhance what you learned in Part 1

The Examination

Quick review of the carpal bones and landmarks



How to Palpate the wrist bones

- Trapezium
- Trapezoid
- Capitate
- Hamate
- Lunate
- Scaphoid
- Pisiform
- Triquetrum

Zones - 5

- Radial Dorsal
- Central Dorsal
- Ulnar Dorsal
- Radial Volar
- Ulnar Volar

Radial Dorsal

- Radial Styloid palpation
- Tenderness may indicate
 - Contusion
 - Fracture
 - Radioscaphoid arthritis
 - Radial deviation may increase tenderness in this area

Radial Dorsal

- Palate scaphoid
 - Tubercle on volar wrist
- Tenderness here may indicate:
 - Fracture
 - Non-union
 - Instability

Radial Dorsal

- ST Joint and Trapezium
- Find the trapezium first
- Possible problems
 - ST arthritis
 - Instability
 - First CMC OA

Radial Dorsal

- Base of 1st metacarpal
- CMC joint

Radial Dorsal

- First extensor compartment (EPB and APL)
 - Forming the snuffbox
 - Finkelsteins test (de Quervain's)

Radial Dorsal

- EPL tendon
 - Check for extension lag
 - Palpate for tenderness

Radial Dorsal

- Palpate muscle bellies of EPB and APL as they cross the wrist tendons

Radial Dorsal

- DRSN
 - Irritation here is referred to as Wartenberg's syndrome
 - If this nerve is irritated it will cause numbness, burning and pain

Central Dorsal

- Lister's Tubercle
 - Separates the scaphoid and lunate fossa

Central Dorsal

- Lunate
 - Just distal and ulnar to Listers tubercle
 - Forms a rounded prominence

Central Dorsal

- Scapholunate interval
- Tenderness may indicate
 - Dorsal wrist ganglion
 - S-L ligament injury
 - Dorsal wrist syndrome

Central Dorsal

- Dorsal wrist syndrome
 - Described by Watson as a localized SL synovitis
 - Positive test produces pain in SL region

Central Dorsal

- S-L ligament injury
 - Scaphoid shift test (Watson test)
 - SL ballotement test

Central Dorsal

- Base of 2nd and 3rd metacarpal pain
- Tenderness may indicate ligament injury
- Linscheid test is performed to assess for instability

Central Dorsal

- Assess ECRL, ECRB, and EDC for tenderness indicating possible tendonitis
- PIN (motor nerve to the extensors)

Ulnar Dorsal

- DRUJ
- Tenderness here may indicate
- Arthritis or instability
- Prominence of the ulnar head is a sign of instability
- Piano key test – move the distal ulna dorsal and volar – positive if pain and increased mobility

Ulnar Dorsal

- TFCC
 - Can palpate between the ulnar head and triquetrum
 - TFCC load

Ulnar Dorsal

- Hamate
- Triquetrum

Ulnar Dorsal

- Midcarpal instability
 - Characterized by a volar sag
 - Midcarpal shift test

Ulnar Dorsal

- LT interval
 - Palpate just ulnar to the lunate
 - LT instability causes tenderness here

Ulnar Dorsal

- Ballotement test or Shuck Sign – Described by Regan
- Kleinman's LT shear test
- Ulnar snuffbox test or Ballotment Test – Described by Linscheid

Ulnar Dorsal

- 4th and 5th CMC joints
 - Tenderness may indicate ligament injury or fracture
- ECU tendon
 - Tenderness with resisted motion may indicate tendonitis
 - Pain and snapping with forearm rotation

Radial Volar

- Radial styloid
- Tenderness may be due to:
 - Fractures
 - Radiocarpal ligament injury
 - Wrist extension and radial will accentuate ligament injury

Radial Volar

- Scaphoid tuberosity
 - Assess in radial deviation
- STT joint
 - Can cause radial volar wrist pain due to arthritis here
 - Radial deviation is often painful

Radial Volar

- Volar wrist ganglion
 - Arises out of the radiocarpal
 - Presents with swelling at the base of the thumb
- Trapezium
 - Located just distal to the pole of the scaphoid
 - Tenderness may indicate a fracture

Radial Volar

- FCR tendonitis
 - Swollen and tender with palpation
- Digital flexor tendons
 - flexor tenosynovitis

Radial Volar

- Median Nerve
- Radial Artery

Ulnar Volar

- Pisiform
 - Tenderness here may indicate:
 - Fracture
- Pisotriquetral arthritis
 - Shear test for pisotriquetral arthritis

Ulnar Volar

- Hook of the Hamate
 - Hamate fracture
- Ulnar nerve
 - Compression of the nerve at Guyon's canal

Ulnar Volar

- FCU
 - Palpate at ulnar volar wrist

Exam review

- The exam of the wrist is very detailed

Treatment of the wrist by diagnosis

The names below are applied to specific patterns of distal radius fracture

- Colles
- Smith
- Barton's
- Chauffeur's

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Physician treatment after fracture of distal radius:

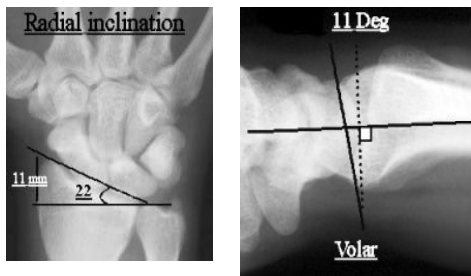
- Closed reduction and casting
- Percutaneous pinning
- Arthroscopic assisted fixation
- ORIF
- Ex-Fix

Regardless of Method Used for reduction...

- The physician must attempt to restore:
 - Articular congruency
 - Radial length
 - Volar tilt
 - Radial inclination
 - Assess DRUJ instability and treat if necessary

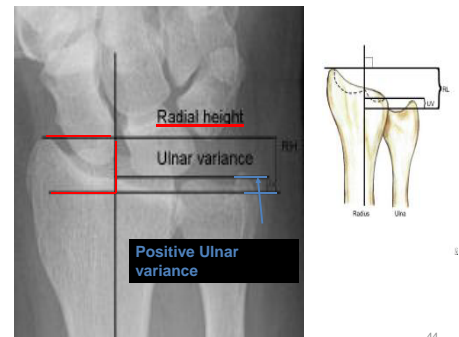
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Radial Inclination (22 degrees) Palmar Tilt (11 degrees)



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Radial Height (length) Normal is 12 mm and Ulnar Variance



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Prior to Treatment the therapist...

- Knowledge of the amount of radial shortening, dorsal angulation, the presence of any articular step-offs or any DRUJ issues will help you to formulate appropriate treatment goals and plans

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Residual deformities to know

- Loss of radial tilt or inclination –normal is 22-33 degrees
- Loss of palmer tilt - Dorsal angulation – normal palmar tilt is 11-12 degrees

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Continued...

- Radial shortening (decreased height) – normal is 12 mm
- Distal radioulnar joint involvement
- Intra-articular involvement

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Realistic goals...

- Keep the patients focus on realistic goals

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Therapy Goal for functional vs normal wrist motion

- **Normal** is 140 flex/ext and 150 sup/pro
- **Functional:**
 - *Palmer et. al:* 30 degrees ext., 5 degrees flexion, 10 degrees RD, 15 degrees UD
 - *Ryu et. al:* 40 degrees ext., 40 degrees flexion, 40 degrees combined rd/UD
 - *Gartland and Werley:* 45 degrees ext., 30 degrees flexion, 15 degrees RD, 15 degrees UD and 50 degrees of each sup/pro

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Important Take Home Message

- For the therapist and patient is that a person can be quite functional with less than “normal” ROM of the wrist.

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Therapy after distal radius fractures:

- After cast removal:
 - Light wrist support may be needed
 - Can now begin wrist ROM
 - Begin static progressive or dynamic splinting after 2 weeks if needed
 - Use e-stim for muscle re-ed if needed

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It has been said...

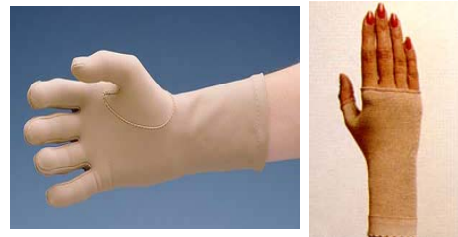
- That the most important principle after distal radius fractures is to reestablish independent wrist extension
- Avoiding the substitution pattern of using the digital extensors

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Edema management

- Best method is elevation
- Overhead pumping
- Avoid sling use
- Distal to proximal massage
- MEM
- Compressive wraps

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Pain management

- Watch for CRPS
- High volt electro-mesh glove can help the edema and pain
- TENS



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Modalities

- Heat and stretch with moist heat or paraffin
- Heat and stretch with ultrasound
- Cold
- Fluidotherapy
- Ultrasound
- Hot mitt
- Laser

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fluidotherapy



Cryo Cuff



Hot mitt



ultrasound



ionto



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Strengthening and ROM programs

- A balance exists between ROM and muscular strength.
- Light strengthening should begin after cast, removal

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Clinic Program

- Exercise regime
- Watch to see when program needs to be changed

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Demo of Clinic Activities and Strengthening for the Wrist

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More demos...

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the Stiff Wrist

- PROM
- Heat and stretch
- US with a stretch
- CPM
- Serial static splint
- Dynamic/static progressive splints

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Static progressive



JAS

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Dynasplint for wrist

Flexion



Extension



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CPM

- They are good to use at night
- Good when stiff in both directions
- Can be portable or table-top

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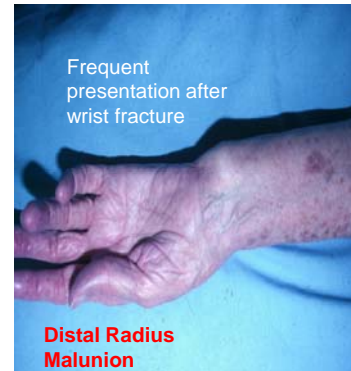


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Stiff Wrist Tx. Continued

- Joint Mobilization
- Soft tissue mob.
- Graston Technique

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What can we as therapists do clinically for malunions?

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Malunions result in many problems

- Patients with shortening and dorsal angulation are likely to have TFCC damage and instability
- Patients with step-offs will likely end up with DRUJ arthritis

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Corrective Osteotomy

Before



After



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Darrach

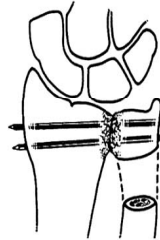
- Distal ulna resection
- Can have problems with the ulnar stump



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Sauve-Kapandji

- Fusion of the DRUJ and creation of a pseudoarthrosis in the distal ulna



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Bowers

- Hemiresection with interposition arthroplasty



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Salvage procedures continued

- One bone forearm – will create one bone to provide stability and eliminate pain but sacrifices all rotation



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Total Wrist Fusion



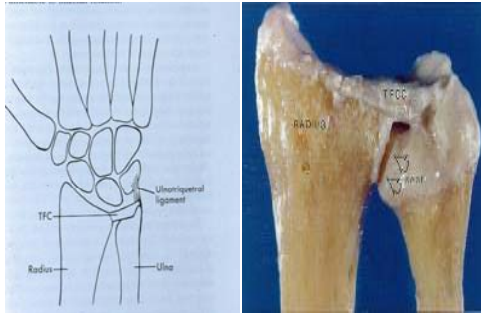
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Wrist Arthroplasty

- Video of Total Wrist Implant

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But it hurts on the other side!



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TFCC testing

- Look for instability of the DRUJ
- TFCC load test
- Piano key sign
- Ulnar Carpal Sag
- LT tenderness

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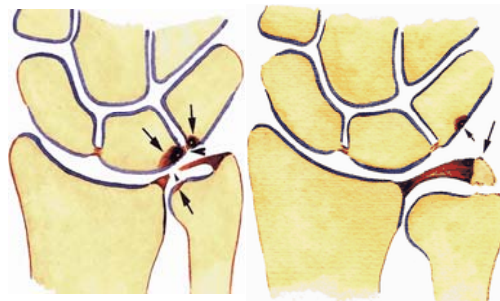
TFCC tears

- If tear is detected acutely can treat with immobilization
- If the tear is on the periphery initial treatment is often immobilization
- If ulnar-positive variance is present an ulnar shortening osteotomy is indicated at any stage.

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central tear

Peripheral tear



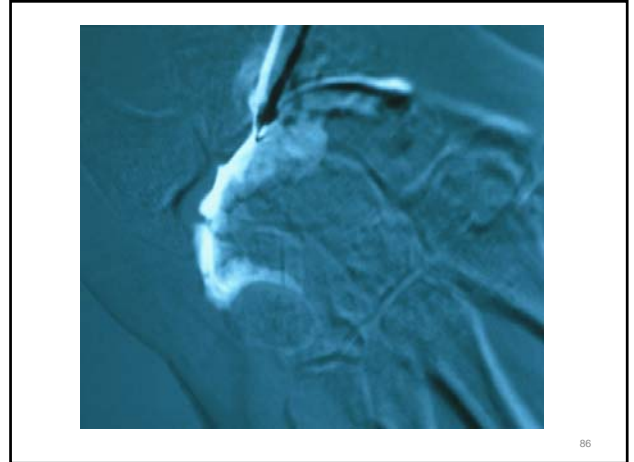
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Case Study



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Dr. Rayhack

- Ulnar shortening procedure

Therapy

- This patient was seen at 6 weeks post op

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Generalized therapy for tfcc

- Non-operative therapy is immobilization
- Operative

Debridement – central tear - therapy

- Volar wrist splint
- AROM at 1 week
- No impact loading
- Light strengthening at 4-6 weeks
- Gradually resume ADL's

Peripheral repair

- Week 1 Long arm cast
- Week 2-4 long arm splint
- Week 4-6 short arm splint
- Week 6-10
 - AROM
 - Avoid extremes of rotation
 - Continue use of splint except for bathing and exercise
 - Light ADL's
 - Week 10 – begin gentle PROM
 - Light strengthening
- 12 weeks continue and upgrade strength program
 - Begin dynamic/static progressive splinting

Management of Carpal fractures

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Scaphoid

- Accounts for 60-70% of carpal fractures
- Cast is short arm with thumb included
- Therapy begins when the fracture is clinically healed

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Why this fracture is missed

- The patient frequently overlooks this fracture because it feels like "just a sprain."
- The fracture may occasionally be invisible on the first x-ray, only to show up on an x-ray examination taken weeks or months later

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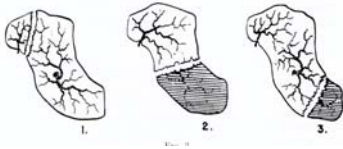
Suspect a scaphoid fracture?

- In cases with clinically suspected scaphoid fracture and negative or inconclusive findings on radiography, the wrist is usually immobilized and the radiographic examination is repeated 10–12 days later.

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Healing time

- Expected time to union for acute fractures:
 - (1) Distal third = 6-8 weeks
 - (2) Middle third = 8-12 weeks
 - (3) Proximal third = 12-24 weeks



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Surgical intervention

- There has been a trend away from the extremes of conservative management



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Method of Fixation Pros/ Cons

- Cast
- Kirschner wires
- Bone screws
- Vascularized distal radius bone graft.

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Scaphoid Fracture



Treatment: compression screw with radial bone graft

Photo Courtesy of Deborah A. Schwartz OTR/L, CHT



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Therapy

- A cast or splint is worn while the scaphoid fracture is healing for six weeks to as long as six months.
- The patient will need to avoid heavy lifting, carrying, pushing, pulling or throwing with the injured arm

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Therapy

- If a fracture is well fixated the patient may be sent to therapy as early as 48 hrs. post. op.
- Gentle force transmission through the fixed fractures can encourage healing of bony tissues

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Strengthening

- Usually allowed by 3 months post

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Stiff wrist

- Big problem after long term immobilization

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Complications of Scaphoid Fractures

- CTS
- Radial sensory n. irritation
- Brawny edema
- Pin tract infections
- CRPS
- Ligament injuries

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Lunate Fractures

- Lunate injuries are generally associated with a fall on an outstretched wrist; a compression force may also be involved.
- Kienböck disease, or AVN of the lunate, is believed by some to be a chronic manifestation of lunate fractures in which collapse of the lunate causes the late development of symptoms

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Conservative Treatment

- Immobilization (4-6 weeks)



X-ray courtesy of Dr. Eaton www.eatonhand.com

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Fx. Highlights

- Hand rehabilitation after lunate fractures with associated ligamentous injury can be prolonged because immobilization can be much greater rather than the usual 4 to 6 weeks for an isolated carpal fracture.

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Kienbock's Disease

- General consensus is that it results from trauma such as a stress fracture, avulsion of capsular structures or a horizontal fracture
- Risk factors include:
 - Ulna variance
 - Lunate geometry
 - Lunate vascularity
 - Vocation/avocation loads
 - TFCC compliance
 - Underlying congenital issues

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Lots of treatment options...

- Immobilization
- Excision arthroplasty
- Lunate decompression
- Wrist denervation
- Limited wrist fusion
- Radius shortening or ulnar lengthening
- Capitate shortening
- Revascularization
- PRC
- Complete wrist fusion

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Video Dr. Rayhack

- Radial Shortening [L](#)

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Therapy

- Mobilization after casting

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Triquetrum Fractures

- Triquetral fractures generally occur on the dorsal surface or, less commonly, involve the body of the triquetrum.

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Triquetrum

120

Fx. Highlights

- Stable injuries and usually are immobilized with a short arm cast for 4 weeks.

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Pisiform Fractures

- The pisiform is a sesamoid bone within the insertion of the flexor carpi ulnaris tendon and is subjected to large stresses.
- Pisiform bone injury often occurs in the setting of a direct blow.

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Pisiform fracture



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Fx. Highlights

- Supervised hand therapy often is not required.

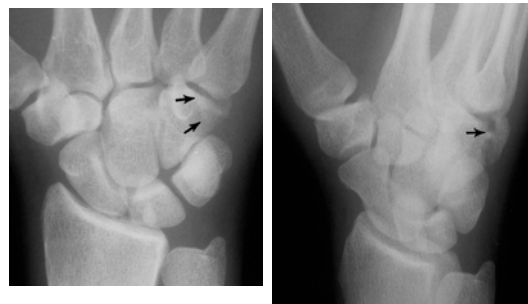
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Hamate Fractures

- These injuries typically heal or become asymptomatic with cast immobilization

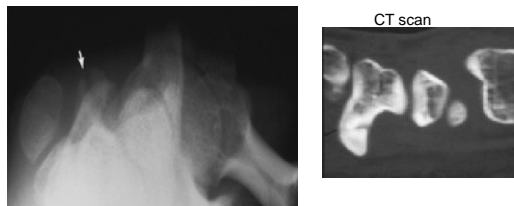
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Hamate



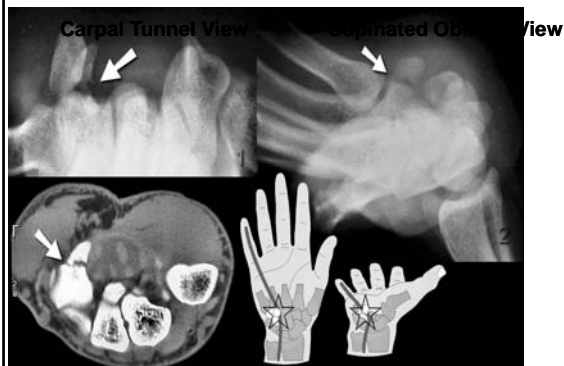
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Hook of Hamate – these can be troublesome



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Hook of Hamate Fracture



X-ray courtesy of Dr. Eaton www.eatonhand.com

Fx. Highlights

- The conservative management of nondisplaced hook of the hamate fractures is short arm casting for 6 to 8 weeks

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Capitate Fractures

- Capitate fractures are a rare injury and diagnosis requires a high index of suspicion based on the mechanism of injury or clinical examination findings



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Fx. Highlights

- Rehabilitation of capitate fractures is similar to rehabilitation of scaphoid fractures.

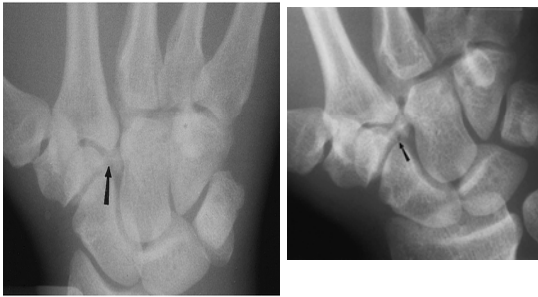
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Trapezoid Fractures

- Fractures of the trapezoid are rare

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Trapezoid



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Fx. Highlights

- Because of the significant trauma often associated with trapezoid fractures, the patient may experience a fair amount of soft tissue injury, edema, and scarring.

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Trapezium Fractures

- Fractures of the trapezium are most commonly transverse loading injuries in the setting of an adducted thumb in which the first metacarpal is driven into the trapezium

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Trapezium



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Fx Highlights

- Conservative management of trapezium fractures is typically with a thumb spica cast.

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Wrist Instabilities

- Instability of the carpal bones results in weakness, stiffness, chronic pain, and often arthritis if not treated appropriately.
- Carpal instability results from an injury to one or more ligamentous or bony constraints in the wrist.

Generalized treatment

- If these injuries are caught early within 4-6 weeks they can be treated with closed reduction, pinning or open repair
- If they are caught 6 weeks to 6 mths they can be treated by ligament repair
- 6 – 12 mths ligament reconstruction or intercarpal arthrodesis
- Longer than 12 mths usually requires intercarpal arthrodesis

Nonenclature for Instabilities

- **By Severity:** *Dynamic, static, subluxation, dislocation*
- **Direction:** *DISI, VISI, Dorsal, volar, radial, ulnar*
- **Location:** *Proximal, distal, radial, ulnar, dorsal, volar, mid-carpal, radio carpal, specific bone, specific ligament*
- **Ligament Type:** *CID, CIND,*
- **Acuity:** *Acute, subacute, chronic*

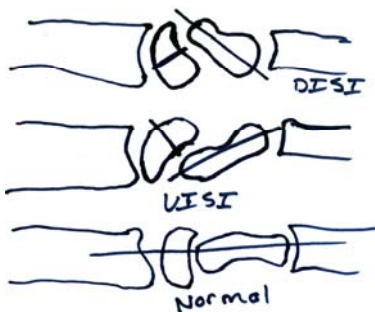
CID/CIND

- Carpal Instability Dissociative (CID)
 - Scapho-lunate dissociation
 - Luno-triquetral dissociation
- Carpal Instability Non-Dissociative (CIND)

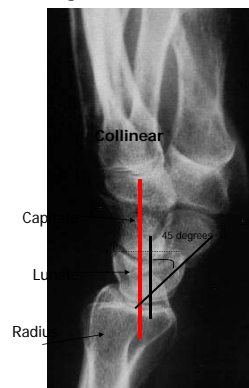
VISI/DISI Facts

- DISI: dorsiflexion instability is more common
- VISI: volar flexion (palmar flexion) instability

DISI/VISI and Normal

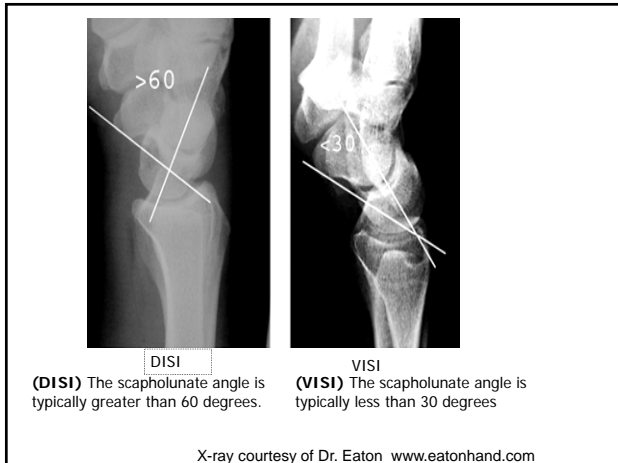


Normal Alignment Lateral view



The **normal** scapholunate angle is between **30° and 60°**,

X-ray courtesy of Dr. Eaton
www.eatonhand.com



Midcarpal Instability

- Rare
- Proximal row becomes dissociated with the distal row

Physical Exam

- Low frequency painful clunk
- Palmar proximal row sag
- Pain with motion
- No pain at rest

Treatment

- Goal is to make the painful clunk an painless intention clunk with conservative tx.
- Conservative treatment – boost splint and therapy

Boost Splint by Terri Skirven

- She finds that grades 1-4 have pain relief and can eventually wean from the splint
- Grade 5 requires the splint to maintain the pain relief and prevent clunking
- Modify work and ADL and manage symptoms
- DO NOT:
 - Squeeze putty
 - Do wrist curls
 - Repetitive wrist ROM exercises

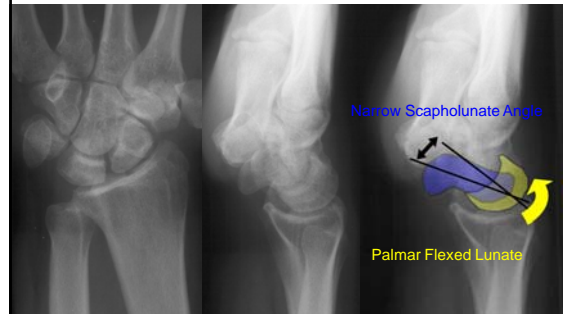
Conservative Management

- Stable wist position: Supination
- Focus on ECU and FCU to stabilize the ulnar wrist
- Isometric exercises vs isotonic (all in supination)

LT Instability

- LT instability presents as a VISI when advanced
- Symptoms include
 - Ulnar sided wrist pain
 - Click or catch
 - Ulnar nerve symptoms
- Testing includes:
 - Shear test
 - Shuck Sign
 - Ballotment Test
 - Tender at It interval

VISI Carpal Instability Advanced



X-ray courtesy of Dr. Eaton www.eatonhand.com

Treatment

- There is no consensus on the appropriate treatment of lunotriquetral instability.

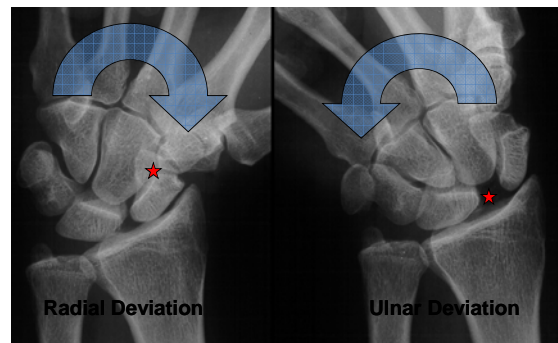
LT Instability after stabilization

- Immobilized 6-8 weeks
- Avoid impact loading and forceful rotation for 4-6 mths

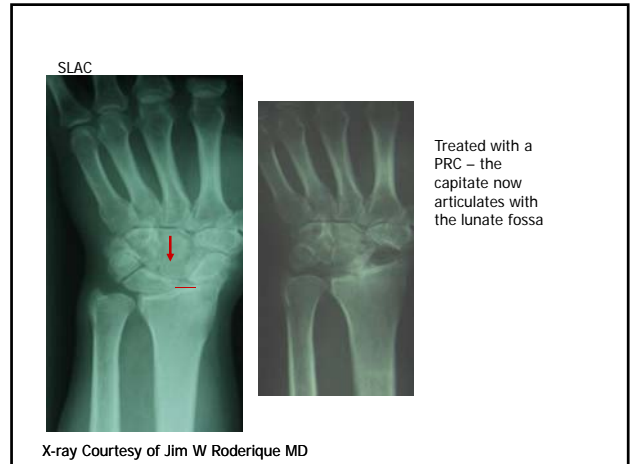
SL Instability

- Associated with DISI
- Lunate extends

Scapholunate Dissociation



X-ray courtesy of Dr. Eaton www.eatonhand.com



Assessing for SL tears

- Scaphoid Shift test – pos. when the clunk occurs after removal of pressure
- SL tenderness
- Patient reports dorsal wrist pain, pain with extension and weakness of grip

Treatment

- Multitudes of soft tissue techniques ie: Dorsal Capsular Advancement (Blatt) and ligament reconstruction
- If the instability is advanced in seen in static films then STT fusion is a good option
- If advanced to a complete SLAC options include: STT or SC fusion with radial styloidectomy, PRC, four corner fusion or arthrodesis

Generalized therapy after wrist arthroscopy

- Promote function
- Maintain Stability
- Protect joint integrity
- Achieve functional ROM
- Wrist splint 5-7 days

Debridements or synovectomy

- Therapy will progress as tolerated after immobilization

SL instability with stabilization

- Immobilized 6-8 weeks
- Avoid weight bearing for 3-6 mths
- Expect a loss of ROM around a 12- 25% loss of flexion/extension and a 12 -30% loss of RD/UD

Carpal Dislocations

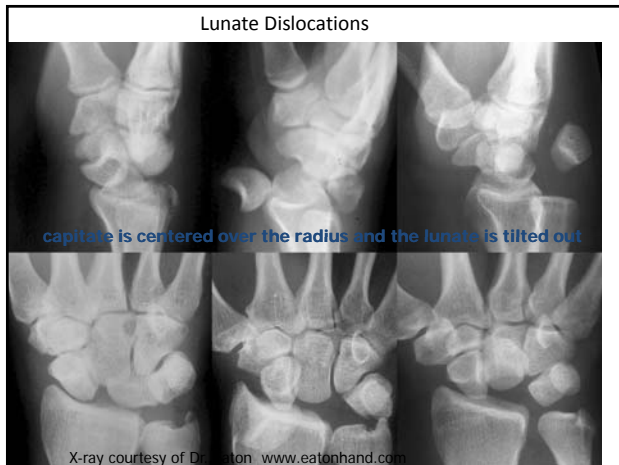
- Are often the result of hyperextension injuries on the out-stretched hand

Lunate vs. perilunate dislocation

- The key to differentiation between these is what is centered over the radius.

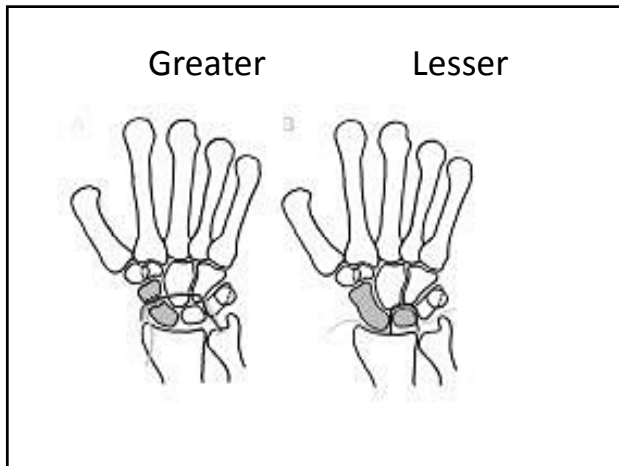
Lunate centers over the distal radius





Arcs (Mayfield)

- Lesser arc
 - Lesser arc injuries are **pure ligamentous** injuries
- Greater arc
 - Fracture dislocation of the **bones** around the lunate



Lesser Arc Stages

- Stage I includes scaphoid dissociation from tearing of the scapholunate interosseous and volar displacement of the radioscapoid joint.
- Stage II includes dorsal dislocation of the capitate with dissociation at the lunocapitate joint.
- Stage III includes lunotriquetral ligament disruption. The lunate remains aligned with the radius, while the rest of the carpus is displaced, usually dorsally.
- Stage IV is complete ligament disruption. The capitate remains aligned with the radius, while the lunate is squeezed out in a volar direction.

Therapy after Lunate or Perilunate Dislocations – lesser arc

- Ligament repair
- Immobilize in a LAC for 4 week and then a SAC for 4 weeks
- Pins out at 8 weeks
- Gentle ROM
- Thumb spica splint for 2-4 more weeks
- 2-4 weeks later can start strengthening

Greater Arc Stages:

Trans - (fractured bone - one or more)

- Stage I: transradial styloid perilunate fracture-dislocation;
- Stage II: transscaphoid perilunate fracture-dislocation;
- Stage III: transscaphoid, transcapitate perilunate fracture-dislocation;
- Stage IV: transscaphoid, transcapitate, transtriquetral perilunate fracture-dislocation; and
- Stage V: complete palmar lunate dislocation associated with carpal fractures

Therapy after Perilunate Fracture Dislocations – Greater Arc Injury's

- Ligaments and bone injured

Treatment

- Numerous combinations of lesser- and greater-arc disruptions are observed
- Similar to most carpal injuries
- The most dreaded complication is carpal instability

The End of One Chapter and the Beginning of another...



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