Exploring Hand Therapy
Manual

Wrist Secrets
The Occupational Therapist’s Approach
Part 2

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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
- Triangulum
- 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 ballottement 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

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

• Ballottement test or Shuck Sign – Described by Regan
• Kleinman’s LT shear test
• Ulnar snuffbox test or Ballotment Test – Described by Linscheid

• 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

• 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

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
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.

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

Continued...

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

Realistic goals...

- Keep the patients focus on realistic goals
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*

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.

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

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

Edema management

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

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

Modalities

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

Strengthening and ROM programs

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

Clinic Program

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

Demo of Clinic Activities and Strengthening for the Wrist
More demos...

the Stiff Wrist

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

Static progressive

Dynasplint for wrist
Flexion
Extension

CPM

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

- Joint Mobilization
- Soft tissue mob.
- Graston Technique

What can we as therapists do clinically for malunions?

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

Corrective Osteotomy

- Before
- After

Darrach

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

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

Bowers

- Hemiresection with interposition arthroplasty

Salvage procedures continued

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

Total Wrist Fusion

Wrist Arthroplasty

- Video of Total Wrist Implant

But it hurts on the other side!
TFCC testing

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

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.

Case Study
Dr. Rayhack
- Ulnar shortening procedure

Therapy
- This patient was seen at 6 weeks post op

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

Scaphoid

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

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

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.
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

Surgical intervention

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

Method of Fixation Pros/Cons

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

Scaphoid Fracture

Treatment: compression screw with radial bone graft

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

Therapy

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

Stiff wrist

- Big problem after long term immobilization.

Complications of Scaphoid Fractures

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

Strengthening

- Usually allowed by 3 months post.
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.

Conservative Treatment

- Immobilization (4-6 weeks)

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.

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

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
Video Dr. Rayhack

- Radial Shortening

Therapy

- Mobilization after casting

Triquetrum Fractures

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

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

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.

Pisiform fracture

Fx. Highlights

• Supervised hand therapy often is not required.

Hamate Fractures

• These injuries typically heal or become asymptomatic with cast immobilization.
Hook of Hamate – these can be troublesome

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

**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

**Fx. Highlights**
- Rehabilitation of capitate fractures is similar to rehabilitation of scaphoid fractures.

**Trapezoid Fractures**
- Fractures of the trapezoid are rare
Trapezoid

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.

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

Fx. Highlights

• Conservative management of trapezial fractures is typically with a thumb spica cast.

Trapezium

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 wrist 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 Lt interval

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 weigh bearing for 3-6 mths
- Expect a loss of ROM around a 12- 25% loss of flexion/extenion and a 12 -30% loss of RD/UD

Carpal Dislocations

- Are often the result of hyperextension injuries on he 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 radioscaphoid 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.

**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 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
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...
REFERENCES


