Ulnar-sided Wrist Pathology in the Athlete
Wen Yau Jennie Yen, PT, DPT, CHT, CLT
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Objectives
1. Describe the relationship between the anatomy and biomechanics of the wrist as they relate to clinical evaluation.
2. Strengthen your knowledge base of ulnar-sided wrist pathology.
3. Identify upper extremity characteristics that may predispose the athlete to ulnar-sided wrist injuries.

The Ulnar Side of the Wrist

Ulnar-sided Wrist Injuries & Conditions

Anatomy and Biomechanics

Distal Radioulnar Joint Anatomy
3 views of complex joint system:
- Osseous anatomy and stability
  - Anteroposterior (AP) view of the forearm in full pronation
  - Lateral view of the forearm in neutral
- Ligamentous stability
  - Distal view of the DRUJ articulation

Anteroposterior View of the Forearm in Full Pronation
- Bicondylar joint:
  - 2 convex articulating surfaces
    - Radial head
    - Ulnar head
  - 2 concave counterparts
    - Sigmoid notch of the proximal ulnar and distal radius
- Axis of rotation through the fovea of the ulnar head and the center of the radial head.
The Lateral View and Radiographic Examination

A. AP view of the DRUJ provides lateral profile of the ulnar styloid
B. Lateral view of the DRUJ provides an AP view of the ulnar styloid

Distal View of the DRUJ

- Two facets
  - Triangular shaped radioulnar ligament → spiral rotation upon insertion of the fovea
  - Central, cartilaginous and avascular region, "the disc;" whereas it peripheral-ligamentous portion is highly vascularized.

Tensegrity

- "DRUJ stability results from an interplay of tensile and compressive forces across bones and ligaments, which is further influenced by dynamic forces introduced by muscles that cross the joint."
- Stability is dependent on two factors.

Osseous Congruity

- The articulating surfaces comprise the convex ulnar head and the concave sigmoid notch.
  - Proximally, convex radial head and the concave ulna (20%)
  - There is a osteocartilaginous volar lip deepens the concavity of the notch to increase the stability (80%).

- The radius curvature of the sigmoid notch is 50% greater than the ulna head.
- The maximum possible joint surface contact is 60% and occurs in neutral.
- At the extremes of pronation and supination, there is only 10% bony contact.

- The ulnar pole articulates with the TFCC distally.
- The fovea separates the ulnar styloid from the ulnar pole.
  - Insertion site of the deep dorsal and palmar radioulnar ligaments
- The ulnar styloid is the insertion site of the superficial branches
  - Extensor carpi ulnaris (ECU) groove is located dorsally

Ligamentous Integrity (static)

- TFCC
  - Articular Disc
  - Palmar Radioulnar Ligament (PRUL)
  - Dorsal Radioulnar Ligament (DRUL)
  - Ulnolunate (UL) Ligament
Ulnotriquetral (UT) Ligament
Extensor Carpi Ulnaris Subsheath
Meniscus Homologue

Additional stability
Ulnolunate and ulnotriquetral ligaments, interosseous membrane, extensor retinaculum and muscle-tendon units.

TFCC ligaments
Palmar and dorsal radioulnar ligaments prevent instability at the extremes of motion.
The UT and UL ligaments restrict palmar translation of the carpus.
There is a reciprocal tightness and slackening of the deep and superficial PRUL and DRUL through the arc of pronosupination.

ECU Subsheath
Directly connected to the DRUL and provides dynamic and static stability.
Meniscus Homologue
Function not well understood.

Interosseous Membrane (IOM)
To stabilize the relationship of the radius and ulna through the arc of forearm rotation.
To limit proximal migration of the radius in the absence of the radial head.

Muscular Compression (dynamic)
Pronator quadratus (primary)
EMG studies of the deep head is active during both pronation and supination.
Extensor carpi ulnaris (ECU) tendon
Potential pronation torque in maximal supination, and vice versa in pronation.

Innervation of the DRUJ and its ligaments
Dorsal region: terminal branch of the posterior interosseous nerve (PIN)
Ulnar region: dorsal sensory branch of the ulnar nerve
Volar region: ulnar nerve branches
Volar DRUJ capsule: branches of the anterior interosseous nerve (AIN)

Proprioceptive stability of DRUJ
Proprioceptive function contributing to neuromuscular stability (Hagert, Garcia-Elias, Ljung 2007)
Free nerve endings predominate in entire TFCC (Rein, Garcia-Elias, Lluch, Hagert 2014)

Triangular Fibrocartilage Complex (TFCC)
Ulnar Impaction/ Ulnar Abutment Syndrome
Extensor Carpi Ulnaris (ECU) Tenosynovitis and Subluxation

Triangular Fibrocartilage Complex (TFCC)
Relative Progression of TFCC Perforations with Age

Ulnar Variance

Palmer Classification of TFFC Lesions

Traumatic (acute) TFCC tears
Palmer Class 1

Pts may report a single event in which acute pain or an insidious onset.
Athletes who participate in sports using racquets, clubs, or bats are particularly at risk because of the forceful torque loads transmitted through the TFCC.

Traumatic (acute) TFCC tears
Palmer Class 1

Degenerative (chronic) Lesions
Palmer Class 2
Ulnar Impaction/ Ulnar Abutment Syndrome

TFCC Degeneration and Age

Degenerative (chronic) Lesions
Palmer Class 2

Ulnar Impaction/ Ulnar Abutment Syndrome

Occurs when the ulnar head is impinging on the ulnar carpus.
It can be seen at any age and symptoms are usually insidious.
Symptoms are usually more pronounced in pronation and exacerbated by loading of the wrist especially in UD.

Extensor Carpi Ulnaris (ECU) Tenosynovitis and Subluxation

Pts may report a more acute onset of symptoms, especially in injury causing tendon subluxation.
Most commonly, athletes experience chronic instability with tenosynovitis from overuse or forceful injury during racquet and other activities, including golf and baseball.

Break!!!

“Physical therapists will be doctorally prepared autonomous practitioners recognized as the primary care physicians of the musculoskeletal system.”
Stanley Paris, APTA Awards Ceremony, 2001
So how do we get there?

Deductive Theory
- Deductive (acute conditions)
  - 16-year-old female presents with acute knee pain after playing basketball
  - Her knee is swollen
  - DEDUCE that the most likely explanation is a torn ACL [HYPOTHESIS]
  - TARGET assessment directly at confirming or refuting the ACL tear [OBSERVATION]
  - CONFIRM or refute the hypothesis [CONFIRMATION]
- The ability to generate a hypothesis early!

Inductive Theory
- Inductive (chronic conditions)
  - 16-year-old female with acute knee pain after playing basketball
  - Her knee is swollen
  - COLLECT assessment information [OBSERVATION]
  - ANALYZE the collected data and look for patterns [PATTERN]
  - GENERATE a tentative hypothesis [THEORY]
- You are looking for pattern recognition!

Physical Examination

Surface Anatomy
- The ulnar head is a rounded prominence on the ulnar side of the wrist.
  - Easily palpated and most prominent with the forearm pronated.
  - The ulnar styloid is localized ulnar and slightly distal to the ulnar head.
  - Once you reach the ulnar styloid, with continued palpation, the fovea can be detected more deeply and palmarly.

- The triquetrum is palpated distal to the ulnar styloid in the “ulnar snuffbox,” interval between the FCU and ECU tendons.
  - The wrist is radially deviated to palpate the triquetrum because the proximal carpal row slides ulnarily with wrist RD.

- Fovea Sign
  - Pressure is applied into the interval between the patient’s ulnar styloid process and FCU tendon.
  - Tenderness and pain may indicate TFCC involvement.
  - Distal radioulnar or ulnotriquetral ligament injuries.

- Deep Ligamentum Subcruentum Radioulnar Ligaments
  - The test is performed with the forearm in supination (dorsal fibers under maximum tension)
Pressure is applied volarly on the distal ulna while stabilizing the radiocarpal unit. Pain may suggest deep dorsal fibers injury, with greater injury, subluxation or gross instability.

☐ The test is repeated with the forearm in pronation (palmar fibers are under tension) Pressure is applied dorsally on the distal ulna while stabilizing the radiocarpal unit. Pain may suggest deep palmar fibers injury.

- Press Test (dynamic loading)
  - The seated patient pushes up off the chair using the affected wrist, creating an axial ulnar load.
  - Ulnar-sided wrist pain that reproduces symptoms may be indicative of TFCC tear.

- Piano Key Test
  - The distal ulna is grasped and moved passively volarly and dorsally at the extremes of pronation and supination.
  - Pain, tenderness, and increased mobility compared to the uninjured side may suggest DRUJ instability.

- Ulnar Compression Test
  - Pressure applied radially on the ulnar head into the sigmoid notch of the radius.
  - Compression of the DRUJ when combined with forearm pronation and supination is painful in the presence of arthritis.

- Ulnocarpal Abutment
  - Tenderness to palpation at the proximal pole of the lunate with or without triquetral involvement.
  - End range of extension, UD, or a combination will often reproduce painful symptoms.
  - Pronation, a position that produces relative ulnar (+) variance may also exacerbate symptoms.

- The ECU tendon is palpated between the ulnar styloid and the base of the 5th metacarpal with the forearm pronated during active UD.
  - ECU Subsheath
    - Tenderness to palpation along ECU tendon adjacent to distal ulna.
  - To test for ECU subluxation, the forearm is supinated and the wrist is UD while the tendon is observed and palpated to assess for subluxation.
    - Pain and snapping with forearm rotation may be indicative of ECU subluxation.

- The Athlete
  - Hand and wrist injuries can occur with competition in any sport, certain injuries are seen more characteristically with a particular sports.
  - The concept of sports-specific, position-specific, and injury-specific intervention should
be considered.

63 The Golfer

64 Protect Your Game
FEEL BETTER, PLAY BETTER

- www.hss.edu/golfportal

65 - Golfers most often sustain overuse injuries as a result of repetitive swings.
  ▪ Detailed history and examination
  □ Onset of symptoms
  □ Level of the golfer (handicap)
  □ Hand dominance
  □ Golf swing phase that symptoms become prominent
  ▪ The majority of golf injuries occur in the lower hand.

66 - Golf swing phase
  □ Backswing
  □ Downswing
  □ Impact
  □ Follow-through
  ▪ Top of backswing
    □ FCU and ECU involvement when the lower wrist goes into excessive RD.
  ▪ Follow-through just after impact
    □ ECU tendinitis, tendon instability, and possibly a tear of the TFCC.
  ▪ Early unlocking during the downswing
    □ ECU tendinopathies

67 - Acute and chronic ECU abnormalities such as tendinosis, subluxation, traumatic
dislocation, and less commonly, rupture is most commonly seen in golfers and racquet-
sport athletes.
  ▪ Disorder may be chronic or can occur after a single traumatic episode of wrist flexion,
  ulnar deviation, and supination.

68 The Tennis Player (other racquet sports)

69 - Elevated risk for developing ulnar-sided wrist disorder and tendinopathy of the wrist
  and hand.

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Any questions?
yenw@hss.edu