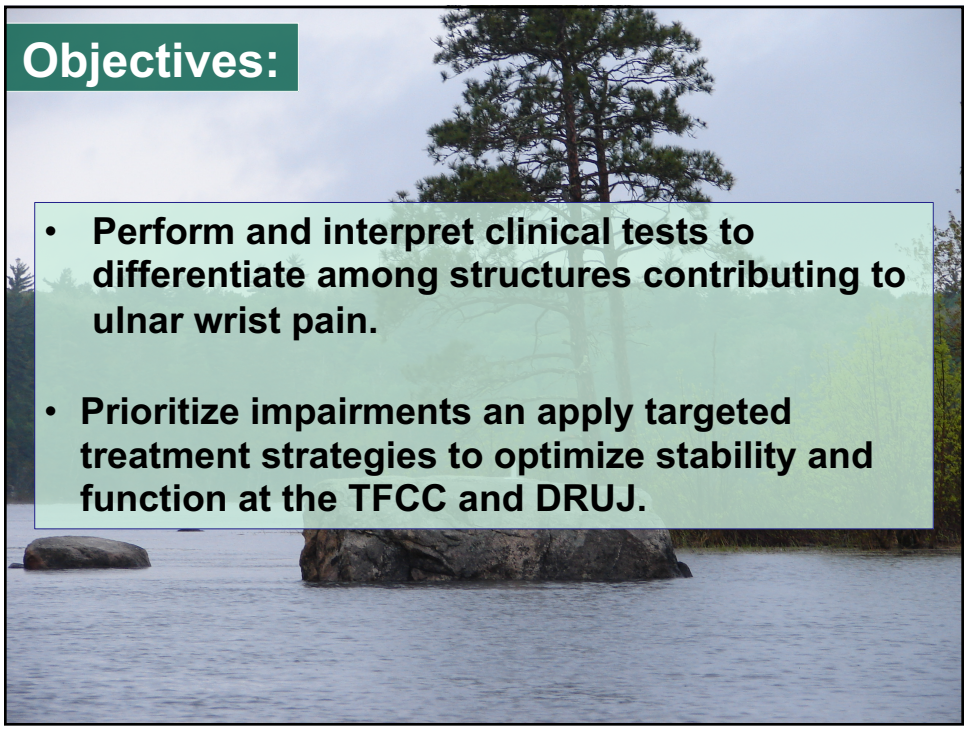
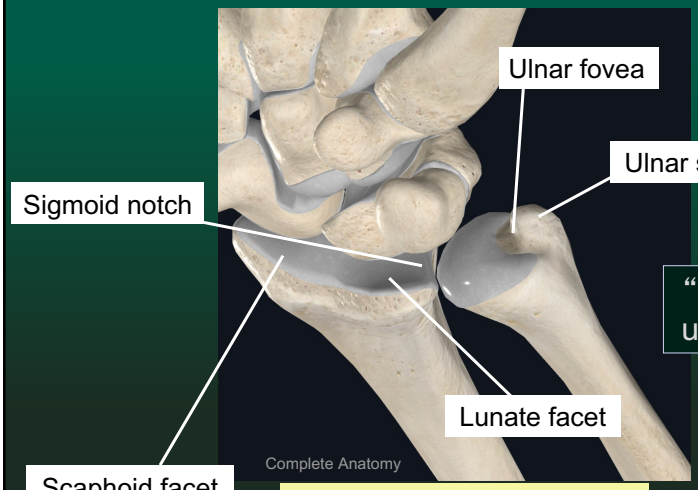

HAND to SHOULDER CENTER
of wisconsin
Ulnar Wrist Pain Unpacked
By Ann Porretto-Loehrke, PT, DPT, CHT, COMT, CMTPT,
Anthony Condie, OTR, CHT
Rachael Gryzwa, OTR, CHT
WS 1671 TP
We-no-nah
Quetico Provincial Park, Ontario, Canada

1


Objectives:
• Perform and interpret clinical tests to differentiate among structures contributing to ulnar wrist pain.
• Prioritize impairments an apply targeted treatment strategies to optimize stability and function at the TFCC and DRUJ.

2

DRUJ: bony anatomy



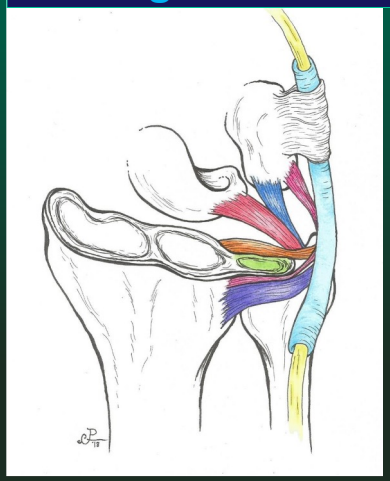
Left wrist in pronation

Flores, DV, Umpire DF, Rakhra KS, et al. Distal radioulnar joint: normal anatomy, imaging of common disorders, and injury classification. Radiographics. 2023 Jan;43(1)e220109 .

3

TFCC: soft tissue anatomy

TriangulоFibroCartilagenous Complex



The TFCC stabilizes the Distal Radioulnar Joint (DRUJ)

Tsai PC & Paksima N. The distal radioulnar joint. Bulletin of the NYU Hospital for Joint Diseases. 2009; 67(1):90-96.

Jawed A, Ansari MT, Gupta V. TFCC injuries: how we treat? J Clin Orthop Trauma. 2020 Jul-Aug;11(4):570-579.

4

TFCC: soft tissue anatomy

Ulnotriquetral ligament

-attaches from the ulnar fovea to the triquetrum

Tsai PC & Paksima N. The distal radioulnar joint. Bulletin of the NYU Hospital for Joint Diseases. 2009; 67(1):90-96.

5

TFCC: soft tissue anatomy

Ulnolunate ligament

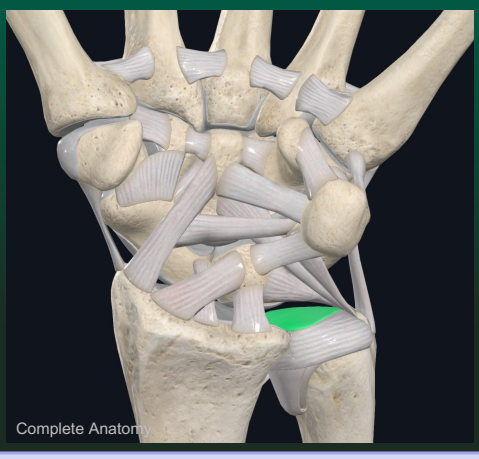
-attaches from the ulnar fovea to the lunate

Tsai PC & Paksima N. The distal radioulnar joint. Bulletin of the NYU Hospital for Joint Diseases. 2009; 67(1):90-96.

6

TFCC: soft tissue anatomy

Articular disc



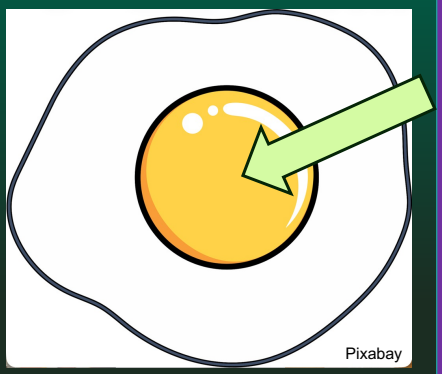
Triangulofibrocartilage
-Triangular-shaped cartilage that provides stability to the ulnar side of the wrist

Tsai PC & Paksima N. The distal radioulnar joint. Bulletin of the NYU Hospital for Joint Diseases. 2009; 67(1):90-96.

7

TFCC: soft tissue anatomy

Articular disc



Triangulofibrocartilage

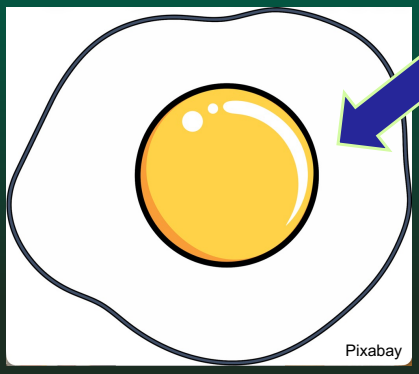
- Central portion (yolk)
- Inner 1/3: has no innervation nor blood supply
- Some have a hole in the central portion (congenital anomaly)
- Poor healing potential

Altman E. The ulnar side of the wrist: clinically relevant anatomy and biomechanics. J Hand Ther. 2016;29:111-122.

8

TFCC: soft tissue anatomy

Articular disc



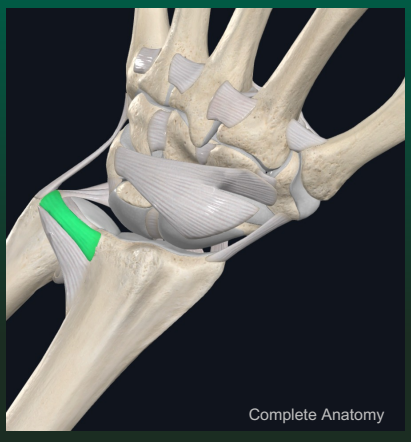
Triangulofibrocartilage
- Outer 1/3 (white portion):
- Highly vascularized & innervated
- Good healing potential

Altman E. The ulnar side of the wrist: clinically relevant anatomy and biomechanics. J Hand Ther. 2016;29:111-122.

9

TFCC: soft tissue anatomy

Dorsal and Volar Radioulnar ligaments



2 portions: superficial & deep

10

TFCC: soft tissue anatomy

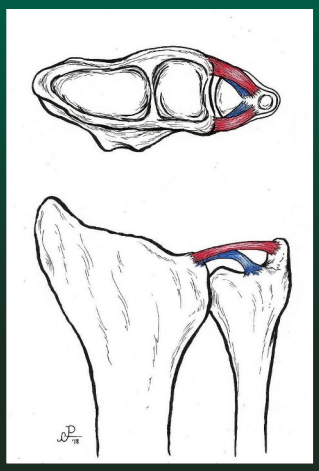
Dorsal and Volar Radioulnar ligaments

2 portions:

-*superficial*: attach to the ulnar styloid

-*deep*: attach to the ulnar fovea

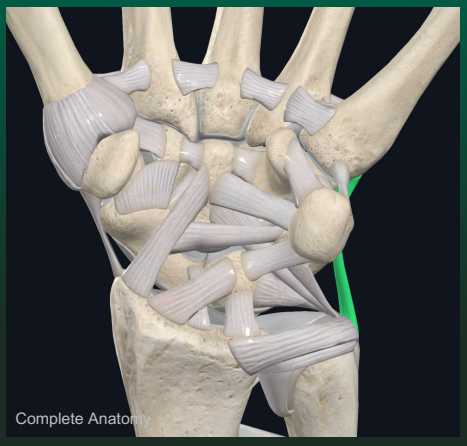
(ligamentum subcruentum)



11

TFCC: soft tissue anatomy

Ulnocarpal Collateral Ligament (UCL)



-Attaches from the ulnar styoid to the triquetrum and pisiform

Tsai PC & Paksima N. The distal radioulnar joint. Bulletin of the NYU Hospital for Joint Diseases. 2009; 67(1):90-96.

12

TFCC: soft tissue anatomy

Extensor Carpi Ulnaris (ECU) tendon & sheath

-Dynamic stabilizer of the Distal Radioulnar Joint (DRUJ)

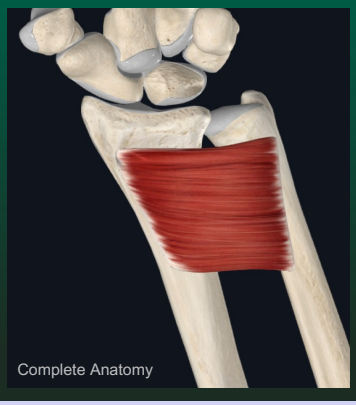
Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

Karagiannopoulos C and Michlovitz S. Rehabilitation strategies for wrist sensorimotor control impairment: from theory to practice. J Hand Ther 2016; 29: 154–165.

13

TFCC: soft tissue anatomy

Pronator Quadratus



-Dynamic stabilizer of the Distal Radioulnar Joint (DRUJ)

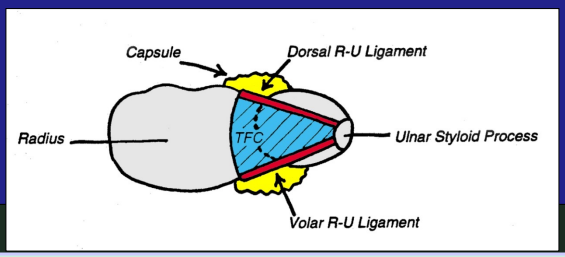
Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

Karagiannopoulos C and Michlovitz S. Rehabilitation strategies for wrist sensorimotor control impairment: from theory to practice. J Hand Ther 2016; 29: 154–165.

14

DRUJ: intrinsic stabilizers

- triangular fibrocartilage (TFC)
- volar & dorsal radioulnar ligaments (superficial & deep)
- ulnar collateral ligament (UCL)
- capsule



Tsai PC & Paksima N. The distal radioulnar joint. Bulletin of the NYU Hospital for Joint Diseases. 2009; 67(1):90-96.

15

DRUJ: extrinsic stabilizers

Interosseous membrane

Distal Oblique Bundle (DOB)

- fibers blend into the capsular tissue of the DRUJ and insert into rim of sigmoid notch
- displays continuity with the volar and dorsal radioulnar ligaments of the TFCC
- constrains volar & dorsal laxity of the radius at the DRUJ in all forearm positions
- present in 40% of dissections (N=30); provided the most stability for the DRUJ in neutral

Trehan SK, Orbay JL, Wolfe SW. Coronal shift of distal radius fractures: influence of the distal interosseous membrane on distal radioulnar joint instability. J Hand Surg Am. 2015; 40:159-162..

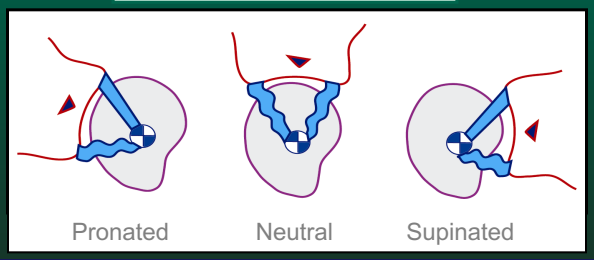
Noda, et al. Interosseous membrane of the forearm: an anatomical study of the ligament attachment locations. J Hand Surg 2009; 34A:415-422.

Wantanabe H, et al. Contribution of the interosseous membrane to distal radioulnar joint constraint. J Hand Surg 2005; 30A:1164-1171.

16

DRUJ: dynamic stability

rotatory motion



- with pronation, the superficial dorsal ligament guides the motion
- with supination, the superficial volar ligament guides the motion

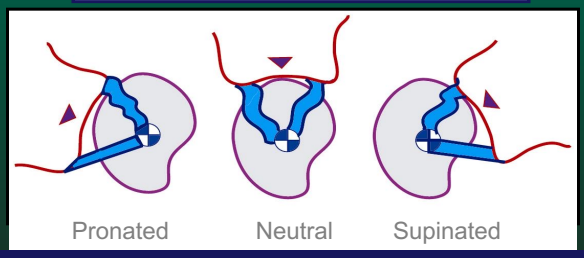
Schuind F, et al. The distal radio ulnar ligaments: A biomechanical study. J Hand Surg 1991; 16A:1106-1114.

Acosta R, Hnat W, Scheker LR. Distal radio-ulnar ligament motion during pronation and supination. J Hand Surg (Br). 1993; 18B: 502-505.

17

DRUJ: dynamic stability

translatory motion (glide)



- with pronation, the deep volar ligament “catches” the radius, controlling the volar translation
- with supination, the deep dorsal ligament controls the dorsal translation

Ekenstam, FA. Anatomy of the distal radioulnar joint. Clin Orthop Rel Res. 1992; 276: 14-18.

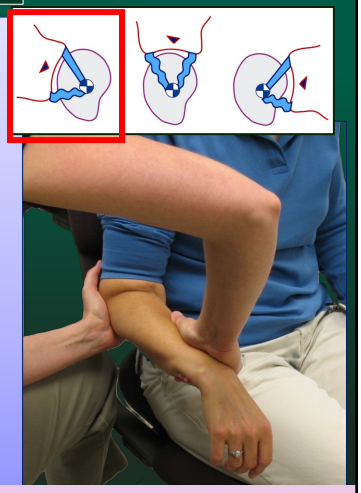
18

DRUJ: dynamic stability

Both dorsal & volar ligaments contribute to pronation & supination…

Forearm pronation:

Tests superficial dorsal ligament with rotatory pronation (i.e. passive FA pronation)



Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

Acosta R, Hnat W, Scheker LR. Distal radio-ulnar ligament motion during pronation and supination. J Hand Surg (Br). 1993; 18B: 502-505.

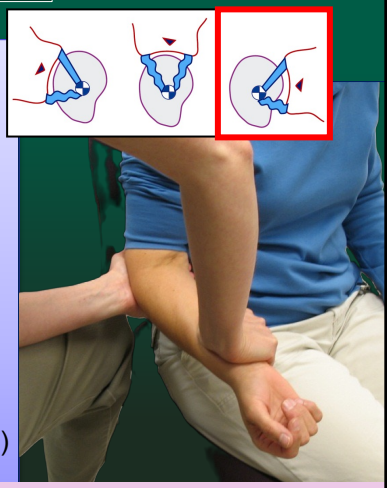
19

DRUJ: dynamic stability

Both dorsal & volar ligaments contribute to pronation & supination…

Forearm supination:

Tests superficial volar ligament with rotatory supination (i.e. passive FA supination)



Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

Acosta R, Hnat W, Scheker LR. Distal radio-ulnar ligament motion during pronation and supination. J Hand Surg (Br). 1993; 18B: 502-505.

20

Forearm Rotation Assessment: PROM

Assessing passive forearm rotation

Video demonstration

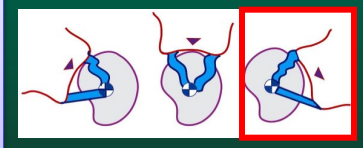
21

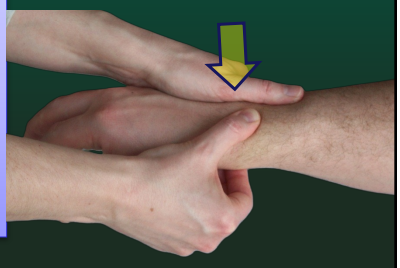
DRUJ: dynamic stability

Both dorsal & volar ligaments contribute to pronation & supination…

Forearm pronation:

Tests deep volar ligament with volar translation (i.e. translation testing in pronation)





Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

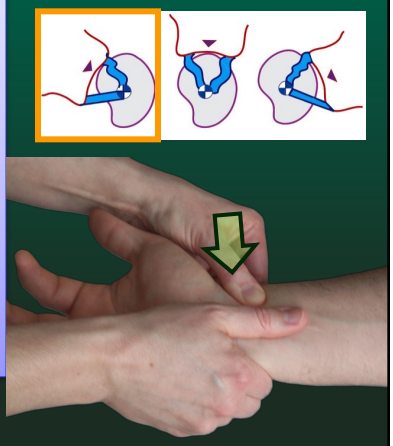
22

DRUJ: dynamic stability

Both dorsal & volar ligaments contribute to pronation & supination…

***Forearm supination*:**

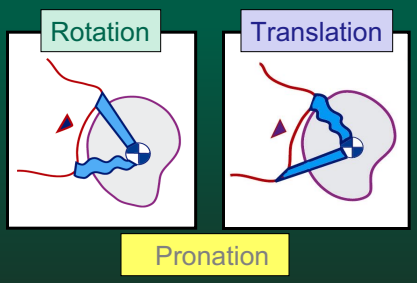
Tests deep dorsal ligament with dorsal translation (i.e. translation testing in supination)



Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

23

DRUJ: dynamic stability

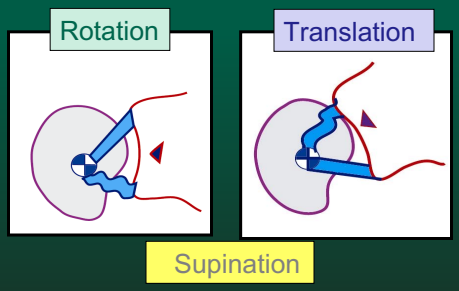


• with pronation, the superficial dorsal R-U ligament tightens (controlling rotation) and the deep volar R-U ligament tightens (controlling translation)

Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

24

DRUJ: dynamic stability



- with supination, the superficial volar R-U ligament tightens (controlling rotation) and the deep dorsal R-U ligament tightens (controlling translation)

Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

25

DRUJ: dynamic stability

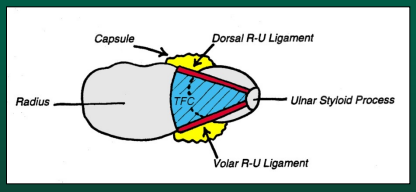
- **dynamic loading is an important component of DRUJ instability**
- **Under loaded conditions, the foveal insertion (deep radioulnar ligaments) had a greater effect on stability than did the styloid insertion**

Haugstvedt J, et al. Relative contributions of the ulnar attachments of the triangular fibrocartilage complex to the dynamic stability of the distal radioulnar joint. J Hand Surg. 2006; 31: 445-451.

Xu J, Tang JB. In vivo changes in the lengths of the ligaments stabilizing the distal radioulnar joint. J Hand Surg. 2009; 34A: 40-45.

26

DRUJ: capsule



capsule

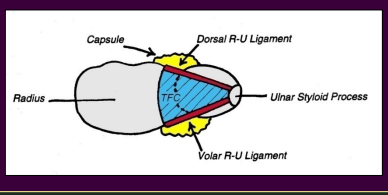
- DRUJ joint capsule provides no significant stability in neutral or mid-range
- provides stability at end-range forearm pronation & supination

Wantanabe H, Berger R, Berglund LJ, Zobitz ME, An KN. Contribution of the interosseous membrane to distal radioulnar joint constraint. J Hand Surg 2005; 30A:1164-1171.

27

DRUJ: rotational stability

- The R-U ligaments and TFC play a key role in stability of the DRUJ in absence of the distal portion of the interosseous membrane (IOM)
- If distal IOM is intact, injury to the R-U ligaments will not demonstrate an instability



Gofton WT, Gordon KD, Dunning CD, Johnson JA, King GJ. Soft-tissue stabilizers of the distal radioulnar joint: an in vitro kinematic study. J Hand Surg. 2004; 25(3):423-431.

28

Distal Fracture & TFCC injury

- *Purpose:* prospective study (N=70) performed to evaluate the outcomes of distal radius fractures associated with or without an injury to the TFCC
- TFCC was injured in 45 patients (64%)
- PRWE and DASH scores showed patients with associated TFCC injury had greater pain and disability at 3 and 12 months
- *Conclusion:* Disability outcomes were worse in patients with distal radius fracture when the TFCC was injured.

Kasapinova K & Kamiloski V. Outcomes of surgically treated distal radius fractures associated with triangular fibrocartilage complex injury. J Hand Ther. 2020;22:339-345.

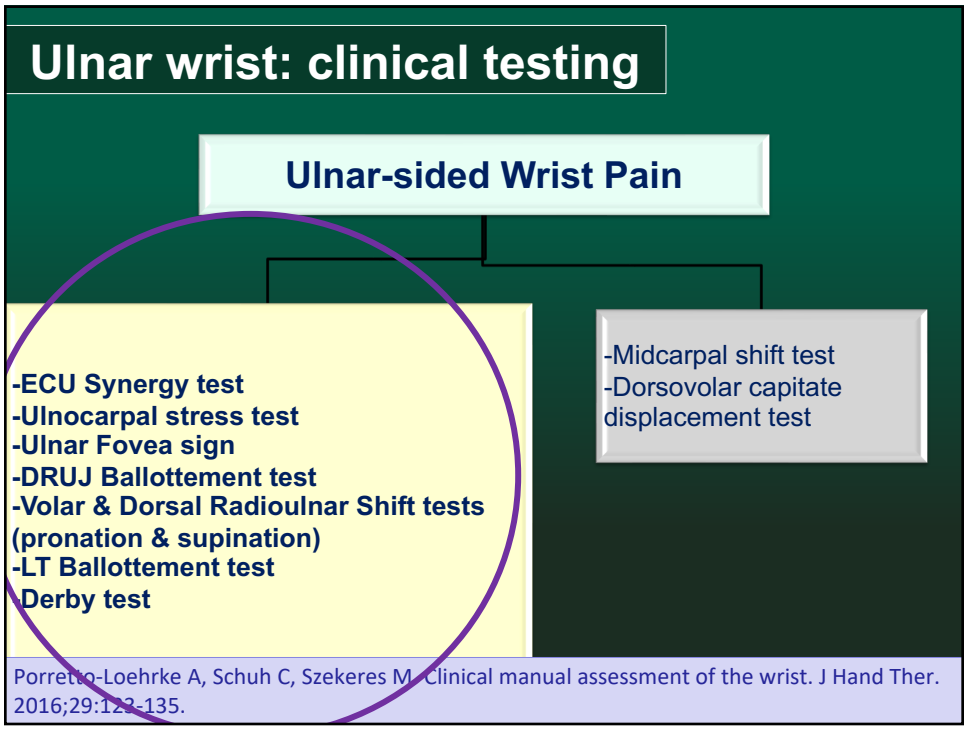
29

Ulnar wrist: clinical testing

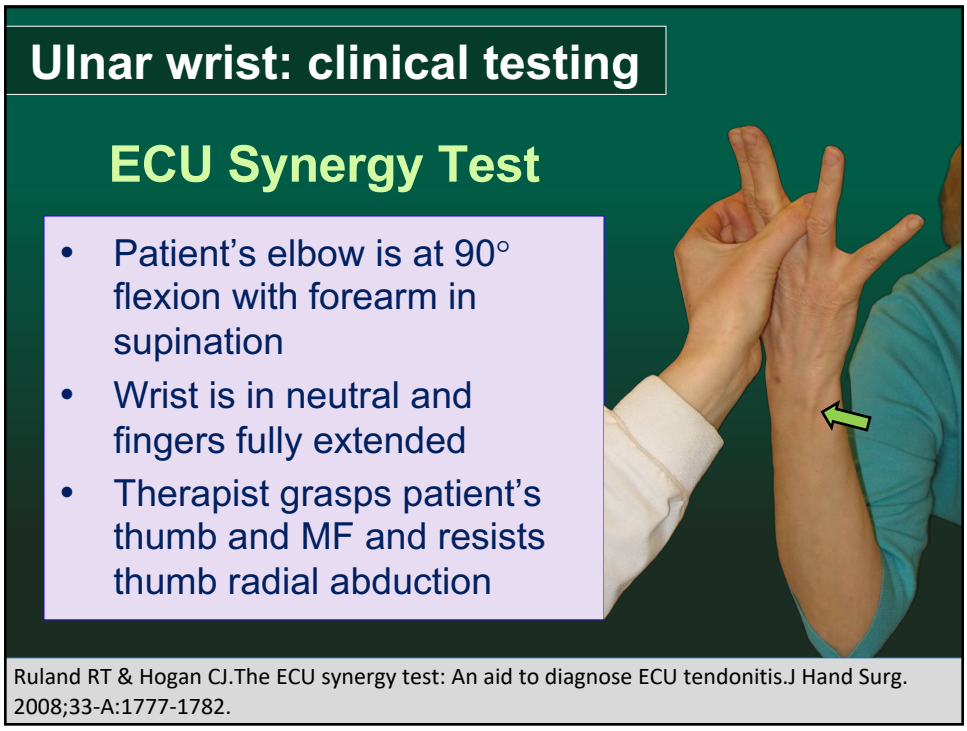
Examination of a suspected TFCC injured patient requires careful palpation and application of few provocative tests…

Jawed A, Ansari MT, Gupta V. TFCC injuries: how we treat? J Clin Orthop Trauma. 2020 Jul-Aug;11(4):570-579.

30


Ulnar wrist: clinical testing
Ulnar-sided Wrist Pain
-ECU Synergy test
-Ulnocarpal stress test
-Ulnar Fovea sign
-DRUJ Ballottement test
-Volar & Dorsal Radioulnar Shift tests (pronation & supination)
-LT Ballottement test
-Derby test
-Midcarpal shift test
-Dorsovolar capitate displacement test
Porretto-Loehrke A, Schuh C, Szekeres M. Clinical manual assessment of the wrist. J Hand Ther. 2016;29:123-135.

31


Ulnar wrist: clinical testing
ECU Synergy Test
• Patient's elbow is at 90° flexion with forearm in supination
• Wrist is in neutral and fingers fully extended
• Therapist grasps patient's thumb and MF and resists thumb radial abduction
Ruland RT & Hogan CJ.The ECU synergy test: An aid to diagnose ECU tendonitis.J Hand Surg. 2008;33-A:1777-1782.

32

Ulnar wrist: clinical testing

ECU Synergy Test

- Look for:
  - Prominence of ECU tendon
  - Provocation of pain along dorsal-ulnar wrist
- Positive likelihood ratio (+LR) 2.9

Valdes K, LaStayo P. The value of provocative tests for the wrist and elbow: a literature review. J Hand Ther 26(2013)32-43.

Ruland RT & Hogan CJ.The ECU synergy test: An aid to diagnose ECU tendonitis.J Hand Surg. 2008;33-A:1777-1782.

33

Ulnar wrist: clinical testing

ECU Synergy Test

34

Ulnar wrist: clinical testing

Ulnocarpal Stress Test

- Place your contralateral hand under the patient's olecranon
- Place the patient's wrist in ulnar deviation (UD)
- Provide an axial load through the wrist, while maintaining wrist UD, as you perform passive forearm pronation & supination
- (+) test: reproduction of ulnar wrist pain

Nakamura R, Horii T, Imaeda E, et al. The ulno-carpal stress test in the diagnosis of ulnar-sided wrist pain. J Hand Surg Br. 1997; 22: 719-723.

35

Ulnar wrist: clinical testing

Ulnocarpal Stress Test

Video

36

Ulnar wrist: clinical testing

Ulnocarpal Stress Test

- Sensitive, but not specific
- (+) test: reproduction of ulnar wrist pain, can include involvement of the TFCC, LT interval, ulnocarpal impaction, arthritis/arthrosis, or a loose body
- Positive likelihood ratio (+LR): 1.0

We need more tests!

Valdes K, LaStayo P. The value of provocative tests for the wrist and elbow: a literature review. J Hand Ther. 2013; 26:32-43.

Sachar K. Ulnar-sided wrist pain: evaluation and treatment of triangular fibrocartilage complex tears, ulnocarpal impaction syndrome, and lunotriquetral ligament tears. J Hand Surg. 2008; 33A: 1669-1679.

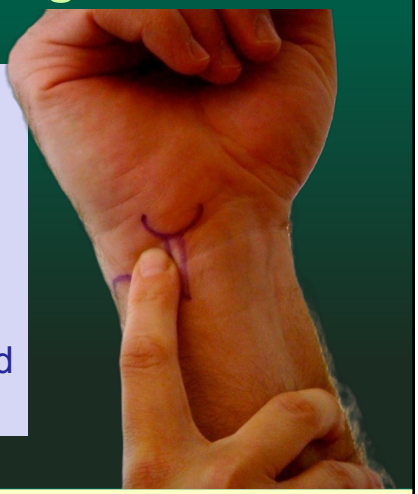
Nakamura R, Horii T, Imaeda E, et al. The ulno-carpal stress test in the diagnosis of ulnar-sided wrist pain. J Hand Surg Br. 1997; 22: 719-723.

37

Ulnar wrist: clinical testing

Ulnar Fovea Sign

- Used to identify an ulnotriquetral (UT) ligament tear or foveal disruption
- Place the wrist and forearm in neutral
- Locate the ulnar fovea between the ulnar styloid and FCU tendon



Tay SC, Tomita K, Berger R. The “ulnar fovea sign” for defining ulnar wrist pain: an analysis of sensitivity and specificity. J Hand Surg. 2007; 32A: 438-444.

38

Ulnar wrist: clinical testing

Ulnar Fovea Sign

- Using your thumb tip, press distal and deep into the "soft spot" (ulnar fovea) between the ulnar styoid, FCU tendon, and volar surface of the ulnar head
- (+) test: exquisite tenderness compared to the univolved side, reproducing the patient's pain

Tay SC, Tomita K, Berger R. The "ulnar fovea sign" for defining ulnar wrist pain: an analysis of sensitivity and specificity. J Hand Surg. 2007; 32A: 438-444.

39

Ulnar wrist: clinical testing

Ulnar Fovea Sign

Video

40

Ulnar wrist: clinical testing

DRUJ Ballottement Test

- For DRUJ instability or TFCC involvement
- Place the forearm in neutral
- Firmly grasp the distal radius and carpus
- Apply a volar-directed force to the distal ulna, perpendicular to the dorsum of the forearm, allowing the distal ulna to return to neutral

Nagashima M, Omokawa S, Hesgawa H, et al. Reliability and validity analysis of the distal radioulnar joint ballottement test. J Hand Surg Am. 2024 Jan;45(1):15-22.

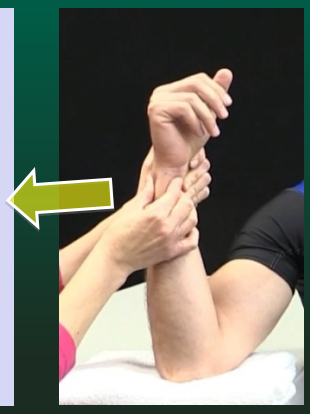
Onishi T, Omokawa S, Iida A, et al. Biomechanical study of distal radioulnar joint ballottement test. J Orthop Res. 2017; 35:1123-1127.

41

Ulnar wrist: clinical testing

DRUJ Ballottement Test

- Then apply a dorsal-directed force, allowing the distal ulna to passively return to neutral
- Compare the amount of excursion of the involved side to the uninvolved side
- (+) test: increased translation compared to the uninvolved side



Nagashima M, Omokawa S, Hesgawa H, et al. Reliability and validity analysis of the distal radioulnar joint ballottement test. J Hand Surg Am. 2024 Jan;45(1):15-22.

Onishi T, Omokawa S, Iida A, et al. Biomechanical study of distal radioulnar joint ballottement test. J Orthop Res. 2017; 35:1123-1127.

42

Ulnar wrist: clinical testing

DRUJ Ballottement Test

43

Ulnar wrist: clinical testing

Radioulnar Ligament Shift Tests

- **Volar Radioulnar Ligament Shift Test**: (forearm in pronation) Evaluates the integrity of the volar deep radioulnar ligament
- **Dorsal Radioulnar Ligament Shift Test:** (forearm in supination) Evaluates the integrity of the dorsal deep radioulnar ligament

Omokawa S, Iida A, Kawamura K, et al. A biomechanical perspective on distal radioulnar joint instability. J Wrist Surg. 2017; 6(2): 88-96.

Chidgey LK. The distal radioulnar joint: problems and solutions. J Am Acad Orthop Surg. 1995; 2: 95–109.

Prosser R, Harvey L, LaStayo P, et al. Provocative wrist tests and MRI are of limited diagnostic value for suspected wrist ligament injuries: a cross-sectional study. J Physiother. 2011; 57(4):247-253.

44

Ulnar wrist: clinical testing

Volar Radioulnar Ligament Shift Test

- Forearm **pronated**: stabilize distal ulna and ulnar carpal column of wrist with an ipsilateral lumbrical grip
- Perform volar translation of the distal radius, then allow it to return to its original position
- Repeat translation as needed for better assessment

Look for: Amplitude of movement compared to uninvolved side

Chidgey LK. The distal radioulnar joint: problems and solutions. J Am Acad Orthop Surg. 1995; 2: 95–109.

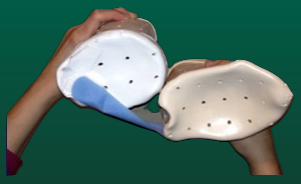
Prosser R, Harvey L, LaStayo P, et al. Provocative wrist tests and MRI are of limited diagnostic value for suspected wrist ligament injuries: a cross-sectional study. J Physiother. 2011; 57(4):247-253.

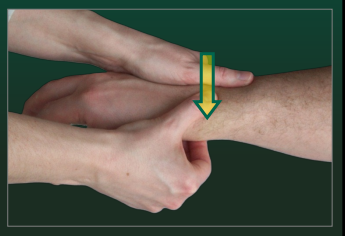
45

Ulnar wrist: clinical testing

Volar Radioulnar Ligament Shift Test

- (+) test: increased amplitude of movement and/or softer end-feel compared to the uninvolved side





Chidgey LK. The distal radioulnar joint: problems and solutions. J Am Acad Orthop Surg. 1995; 2: 95–109.

Prosser R, Harvey L, LaStayo P, et al. Provocative wrist tests and MRI are of limited diagnostic value for suspected wrist ligament injuries: a cross-sectional study. J Physiother. 2011; 57(4):247-253.

46

Ulnar wrist: clinical testing

Volar Radioulnar Ligament Shift Test

- (+) test: increased amplitude of movement and/or softer end-feel compared to the uninvolved side

Chidgey LK. The distal radioulnar joint: problems and solutions. J Am Acad Orthop Surg. 1995; 2: 95–109.

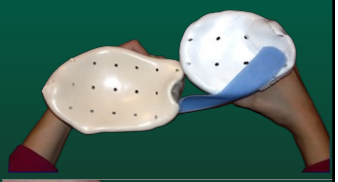
Prosser R, Harvey L, LaStayo P, et al. Provocative wrist tests and MRI are of limited diagnostic value for suspected wrist ligament injuries: a cross-sectional study. J Physiother. 2011; 57(4):247-253.

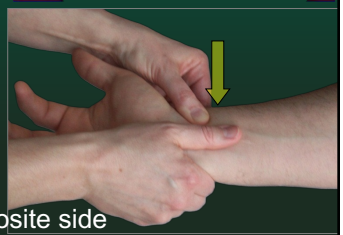
47

Ulnar wrist: clinical testing

Dorsal Radioulnar Ligament Shift Test

- Forearm **supinated**: stabilize distal ulna and ulnar carpal column with an ipsilateral lumbrical grip
- Perform volar translation of the distal radius, then allow it to return to it's original position
- Repeat translation as needed for better assessment





Look for: Amplitude of movement compared to opposite side

Chidgey LK. The distal radioulnar joint: problems and solutions. J Am Acad Orthop Surg. 1995; 2: 95–109.

Prosser R, Harvey L, LaStayo P, et al. Provocative wrist tests and MRI are of limited diagnostic value for suspected wrist ligament injuries: a cross-sectional study. J Physiother. 2011; 57(4):247-253.

48

Ulnar wrist: clinical testing

Dorsal Radioulnar Ligament Shift Test

- (+) test: increased amplitude of movement and/or softer end-feel compared to the uninvolved side

Chidgey LK. The distal radioulnar joint: problems and solutions. J Am Acad Orthop Surg. 1995; 2: 95–109.

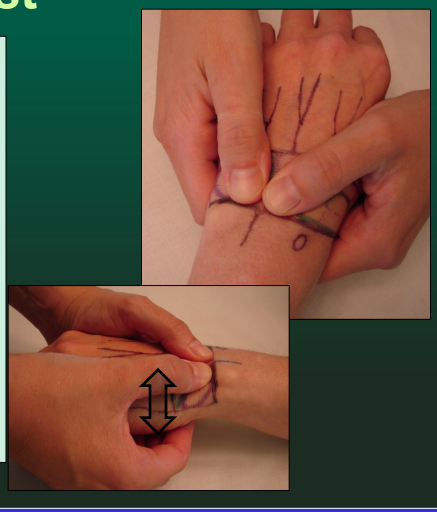
Prosser R, Harvey L, LaStayo P, et al. Provocative wrist tests and MRI are of limited diagnostic value for suspected wrist ligament injuries: a cross-sectional study. J Physiother. 2011; 57(4):247-253.

49

Ulnar wrist: clinical testing

LT Ballottement Test

- STEP #1: The therapist stabilize the lunate with the index and thumb of one hand.
- STEP #2: With the other hand, the therapist grasp the Triquetrum dorsally and pisiform volarly and displace the pisotriquetral unit volarly, then dorsally.



Mirza A, Mirza JB, Zappia LC, et al. Ulnar-sided wrist pain: a diagnostic evaluation guide from 30-plus years of experience. Cureus. 2024 Jan 31;16(1):e53332.

50

Ulnar wrist: clinical testing

LT Ballottement Test

- A positive result elicits pain, crepitus, and increased motion of the joint (compared to uninvolved side)
- Positive likelihood ratio (+LR) 1.03
- Negative likelihood ratio (-LR) 0.80

Valdes K, LaStayo P. The value of provocative tests for the wrist and elbow: a literature review. J Hand Ther 26(2013)32-43.

Mirza A, Mirza JB, Zappia LC, et al. Ulnar-sided wrist pain: a diagnostic evaluation guide from 30-plus years of experience. Cureus. 2024 Jan 31;16(1):e53332.

51

Ulnar wrist: clinical testing

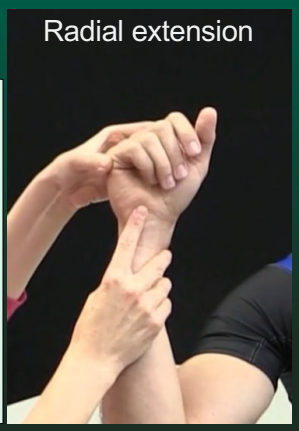
LT Ballottement Test

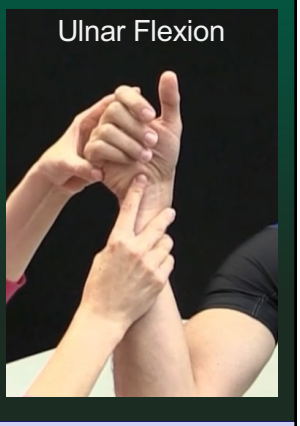
52

Ulnar wrist: clinical testing

Derby Test

Therapist loads the pisiform in a dorsal direction while patient moves the wrist along *the "dart-throwing"* plane.





Christodoulou L, Bainbridge LC. Clinical diagnosis of triquetrolunate ligament injuries. J Hand Surg (Br). 1999;24(5):598-600.

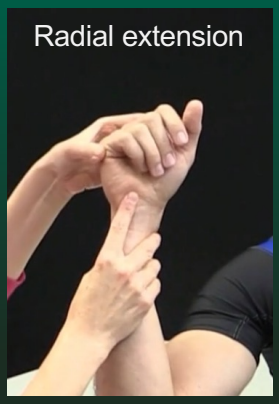
53

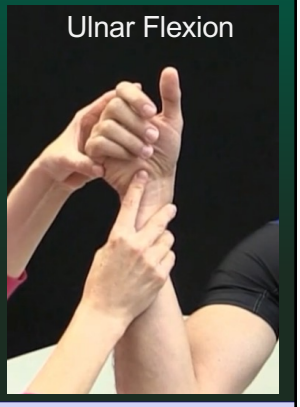
Ulnar wrist: clinical testing

Derby Test

This reduces the subluxation of the LT joint causing the feeling of instability to disappear (with sustained pressure over the pisiform

(+) test: reduction or elimination of symptoms





Christodoulou L, Bainbridge LC. Clinical diagnosis of triquetrolunate ligament injuries. J Hand Surg (Br). 1999;24(5):598-600.

54

Ulnar wrist: clinical testing

Derby Test

- This reduces subluxation of the LT joint causing feeling of instability to disappear and grip strength to increase (with sustained pressure over the pisiform).
- Multiple versions of this test reported in the literature
  - May be combined with grip strength
    - Increased grip/reduced pain = positive test

Valdes K, LaStayo P. The value of provocative tests for the wrist and elbow: a literature review. J Hand Ther. 2013; 26:32-43.

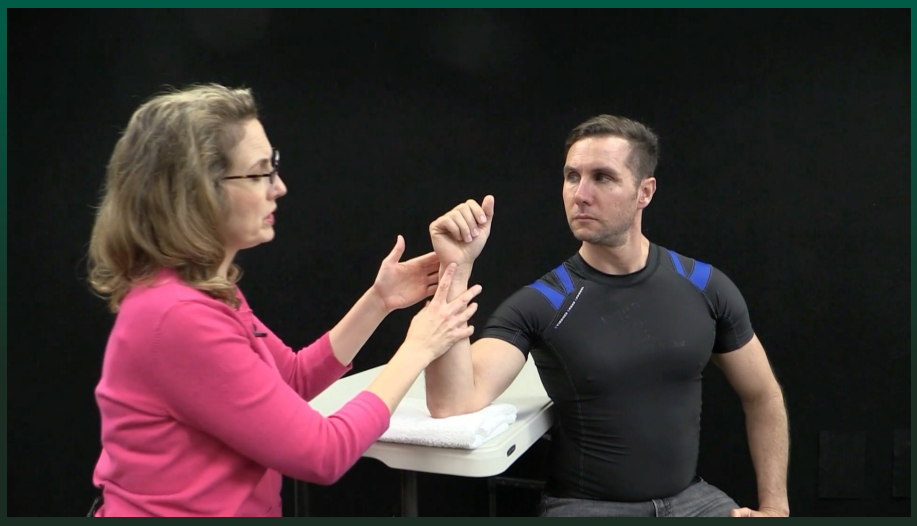
Christodoulou L, Bainbridge LC. Clinical diagnosis of triquetrolunate ligament injuries. J Hand Surg (Br). 1999;24(5):598-600.

Rhee PC, Sauve PS, Lindau et al. Examination of the wrist: ulnar-sided wrist pain due to ligamentous injury. J Hand Surg Am. 2014;Sep;39(9):1859-62.

55

Ulnar wrist: clinical testing

Derby Test



56

Ulnar wrist: clinical testing

Derby Test: another option!

Rhee PC, Sauve PS, Lindau et al. Examination of the wrist: ulnar-sided wrist pain due to ligamentous injury. J Hand Surg Am. 2014;Sep;39(9):1859-62.

57

Ulnar wrist: clinical testing

Grip strength

Patients with TFCC tears had a 52.9% to 92.7% grip strength difference when compared with their contralateral side

- Following surgical repair, grip strength improved from 61% to 103.6%

Lee SH & Gong HS. Grip strength measurement for outcome assessment in common hand surgeries. Clini Orthop Surg. 2022 Mar;14(1):1-12.

58

Ulnar wrist: clinical testing

Push Off Test

- Using a handheld dynamometer with the 2nd rung placed with the convex side up, the patient is positioned in 10-40º of shoulder ext & 10-40º of elbow flexion. The dynamometer is stabilized by the therapist while the patient applies maximal tolerable load

Vincent JI, MacDermid JC, Michlovitz SL, et al. The push-off test: development of a simple, reliable test of upper extremity weight-bearing capability. J Hand Ther. 2014;27:185-191.

Mehta SP, George HR, Georing CA, et al. Reliability, validity, and minimal detectable change of the push-off test scores in assessing upper extremity weight-bearing ability. J Hand Ther. 2019:32:103-109

59

Ulnar wrist: clinical testing

Wrist Weight-Bearing Test

- Originally described by Lester et al in 1995 as the ”Press Test” to aide in the diagnosis of TFCC tears
- Modified by Wendy Medeiros using a nondigital scale on a solid surface. Barlow et al. established normative values for this test (N=465)

Lester B, Halbrecht J, Levy IM, Gaudinez R. “Press test” for office diagnosis of triangular fibrocartilage complex tears of the wrist. Ann Plast Surg. 1995;35(1): 41e45.

Barlow SJ, Scholtz J-S, Medeiros W. Wrist weight-bearing tolerance in healthy adults. J Hand Ther. 2022;35:74-79.

60

Ulnar wrist: clinical testing

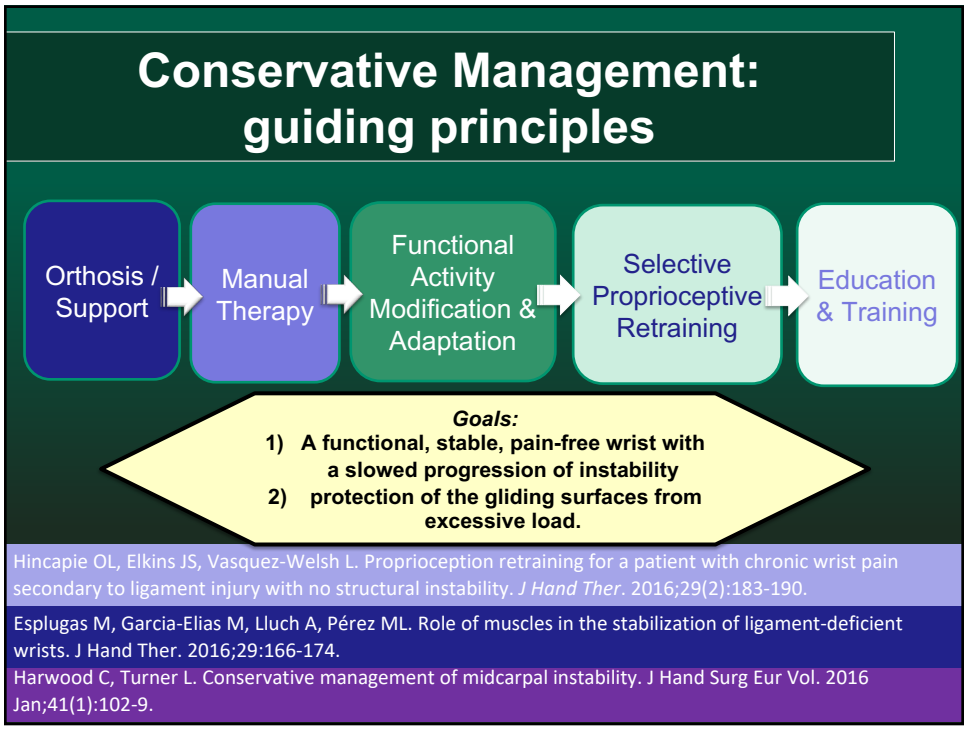
Helpful hint! ☺

With the Grip strength, Push Off Test, or Wrist Weight-Bearing Test, it can be helpful to test initially, then apply a brace (Bullseye, Wrist Widget, etc.) and see if the patient's pain is less and/or strength improves.

This can be a nice objective measure to further solidify your plan of care!

61

62



Hincapie OL, Elkins JS, Vasquez-Welsh L. Proprioception retraining for a patient with chronic wrist pain secondary to ligament injury with no structural instability. *J Hand Ther*. 2016;29(2):183-190.

Esplugas M, Garcia-Elias M, Lluch A, Pérez ML. Role of muscles in the stabilization of ligament-deficient wrists. J Hand Ther. 2016;29:166-174.

Harwood C, Turner L. Conservative management of midcarpal instability. J Hand Surg Eur Vol. 2016 Jan;41(1):102-9.

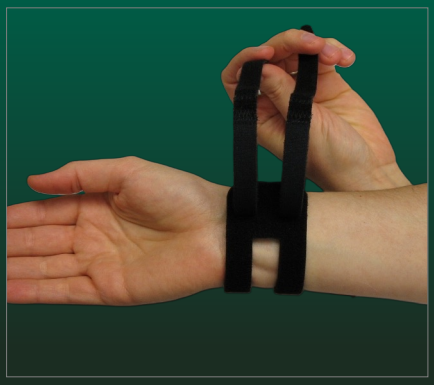
63

Scigliano N, McSweeny KF, Fleury IG, et al. Ulnar variance in athletes: a scoping review. Sports Health. 2024 Jul-Aug;16(4):581-587.

64

DRUJ: treatment

Pre-fabricated Orthotic options:



Wrist Widget

65

DRUJ: treatment

Pre-fabricated Orthotic options:

Wrist widget: Improved weight-bearing ability in a retrospective study (N=23) from 48 to 59% ($p<0.001$).

Asmus, A et al. Increase of weight-bearing capacity of patients with lesions of the TFCC using a wrist brace. Journal of Hand Therapy. 2021;Mar 28;S0894-1130(21)00046-6.

66

DRUJ: treatment

Pre-fabricated Orthotic options:

Bullseye Brace

67

DRUJ: treatment

Pre-fabricated Orthotic options:

Ulnar Squeeze

68

DRUJ: treatment

Pre-fabricated Orthotic options:

Wrist Restore

Note: If a patient also has ECU tenosynovitis, the Wrist Restore may not be the best option!

69

Conservative Management: guiding principles

Manual Therapy

- Address soft tissue issues:
  -ECU tendinopathy/tenosynovitis

70

TFCC: soft tissue issues

Principles of Transverse Friction Massage (TFM)

- Place the involved structure on slight stretch (comfortable range)
- Insertion tendinopathy or tendinitis: small, specific area—use thumb or IF (reinforced by MF)
- Tenosynovitis: broader area—use 2-3 fingers
- Perform friction in one direction only
- The more chronic the condition, the longer you perform the TFM (example: acute: 3-5 minutes; chronic: 10-12 minutes)
- Perform every other day

71

TFCC: ECU tendinopathy

CLINICAL FINDINGS:

- Pain with resisted Wrist Extension with UD
- (+) ECU Synergy test

TFM technique

- place forearm in pronation with wrist in slight flexion & RD
- locate painful site where the ECU inserts into base of 5th metacarpal
- use IF, reinforced by MF, to perform friction

72

TFCC: ECU tendinopathy

TFM for ECU Tendinopathy

Video

73

TFCC: ECU tenosynovitis

CLINICAL FINDINGS:

- Pain with passive forearm supination
- Pain with passive wrist flexion & RD

TFM technique:

- Place FA in pronation with wrist in slight flexion and RD
- with 2 or 3 fingers, perform friction across the ECU tendon and sheath

74

TFCC: ECU tenosynovitis

TFM for ECU tenosynovitis

Video

75

Conservative Management: guiding principles

Functional Activity Modification & Adaptation

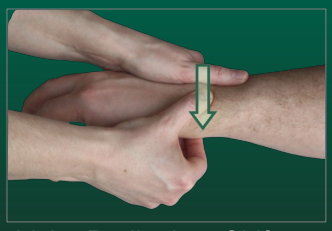
- Temporary avoidance of gripping and weight-bearing activities
- Dependent on exam findings: avoidance of forearm pronation or supination—see next slide! ☺

76

Conservative Management: guiding principles

Functional Activity Modification & Adaptation

- **If the Volar Radioulnar Shift test is (+):** temporarily avoid activities in pronation
- **If the Dorsal Radioulnar Shift test is (+):** temporarily avoid activities in supination



Volar Radioulnar Shift test

Dorsal Radioulnar Shift test

77

WSRP: Wrist Sensorimotor Rehab Program

Selective Proprioceptive Retraining

Stage of Intervention with Rehab Goals	Rehabilitation Techniques
Stage 1 Goal: Pain control	-DTM AROM -Interval use of orthosis
Stage 2 Goal: Muscle re-education, joint awareness	-Continue DTM AROM -Isometric strengthening: PQ & ECU -Isotonic DTM -Wearing orthosis at night
Stage 3 Goal: Neuromuscular rehabilitation	-Cont with isometric PQ & ECU, progress to isotonic -Reactive Muscle Activations (RMA) -Graded weight bearing -Coordination training with weaning from orthosis
Stage 4 Goal: Movement normalization & function	-Stop isometric & isotonic exercises -Continue with RMA -Progress weight bearing -Resistive coordination training

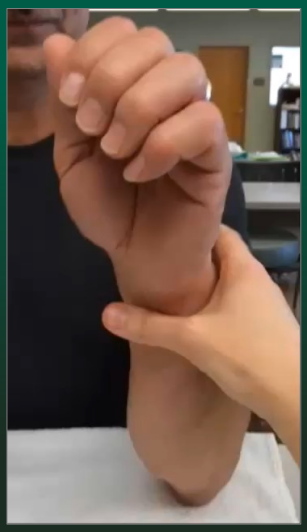
Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

78

Stage 1: Pain Control

Active Dart Thrower's Motion

- Patient moves through available pain-free radial extension to ulnar flexion. Proper plane is achieved by keeping the forearm in about 45 degrees of pronation.
- **20 reps, 3-5 sets daily**



Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

79

Progression…

Criteria for moving to Stage 2:

- No pain with full wrist or forearm AROM
- Continue: DTM AROM in Stage 2

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

80

Stage 2: Muscle Re-ed & Joint Awareness

Muscles to focus on with TFCC injury:

- **Pronator Quadratus (PQ):** contributes to the stability of the DRUJ due to its insertion on the capsule, which tightens during contraction
- **Extensor Carpi Ulnaris (ECU):** contraction is hypothesized to stiffen the ulnocarpal joint

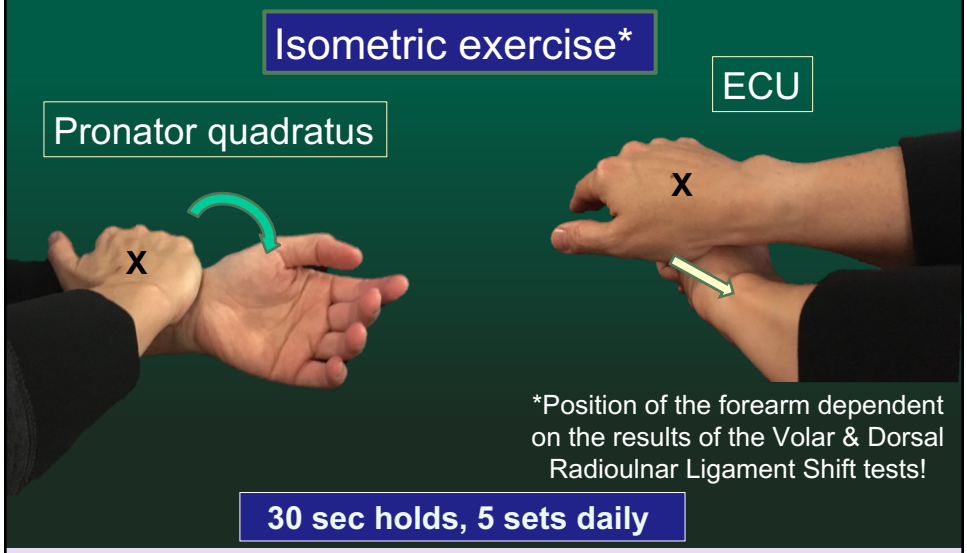
Hagert E, Hagert CG. Understanding stability of the distal radioulnar joint through an understanding of its anatomy. Hand Clin. 2010;26(4):459-466.

Karagiannopoulos C, Michlovitz S. Rehabilitation strategies for wrist sensorimotor control impairment: from theory to practice. J Hand Ther. 2016;29(2):154-165.

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

81

Stage 2: Muscle Re-ed & Joint Awareness

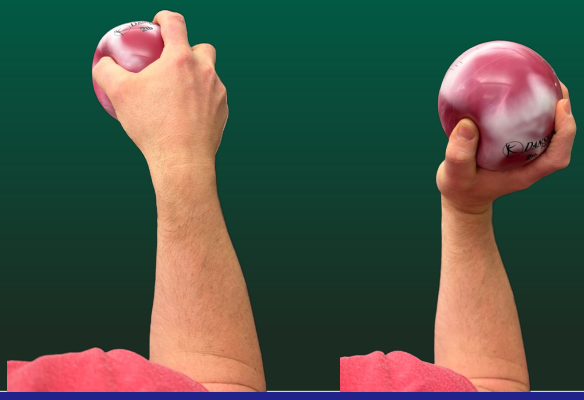


Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

82

Stage 2: Muscle Re-ed & Joint Awareness

Isotonic Dart Thrower's Motion



1.1 lb (0.5 kg) weighted ball: 10-20 reps x 3 sets, 3-4x/week

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

83

Stage 2: Muscle Re-ed & Joint Awareness

Isotonic Dart Thrower's Motion

84

Progression…

Criteria for moving to Stage 3:

- < 2/10 pain with isotonic exercise
- Able to complete 10 reps x 2 sets of exercise
- Able to maintain control through the range

- Continue with isometric PQ & ECU; progress to isotonics: 10-20 reps x 5 sets, 3-4x/week

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

85

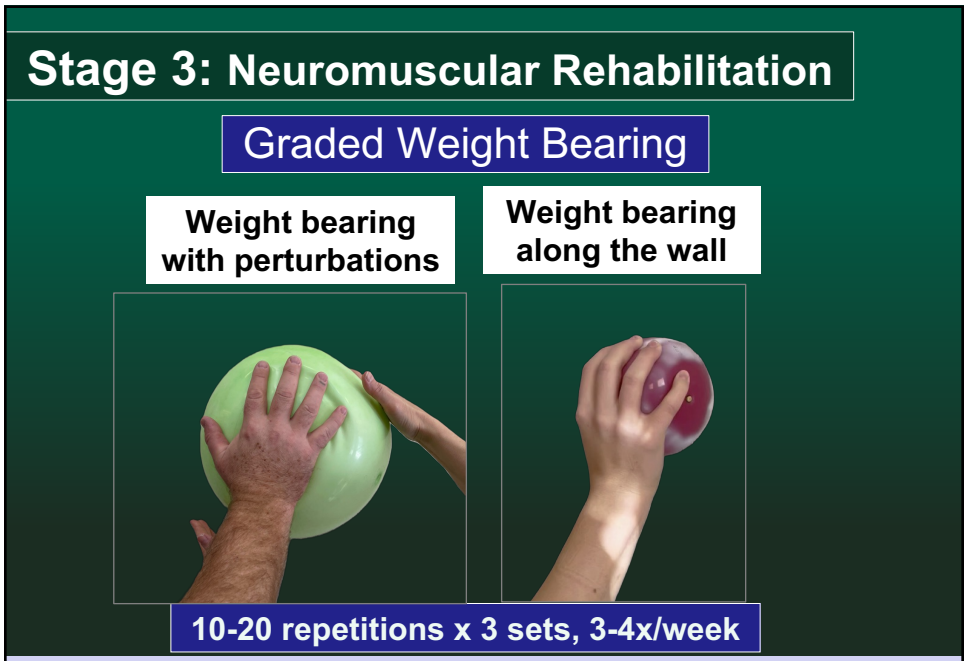
Stage 3: Neuromuscular Rehabilitation

Reactive Muscle Activation

Flexbar Displacement: 2-3 minutes x 3 sets, 3-4x/week

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

86



Chen Z. A novel staged wrist sensorimotor rehabilitation program for a patient with triangular fibrocartilage complex injury: a case report. J Hand Ther. 2019;32:525-534.

87

Chen Z. A novel staged wrist sensorimotor rehabilitation program for a patient with triangular fibrocartilage complex injury: a case report. J Hand Ther. 2019;32:525-534.

88

Stage 3: Neuromuscular Rehabilitation

Coordination Training

Bilateral UE AROM in PNF pattern or unilateral using free weight

89

Stage 3: Neuromuscular Rehabilitation

Wean from the orthosis

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

90

Progression…

Criteria for moving to Stage 4:

- < 2/10 pain with weight bearing along the wall
- Good multi-joint coordination

- Discontinue isometric & isotonic exercises
- Continue Reactive Muscle Activations
- Progress with weight bearing
- Resistive coordination training

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

91

Stage 4: Movement normalization & functions

Progress with Reactive Muscle Activations (RMA)

Power ball or Weighted Slosh Pipe

2-3 minutes x 3 sets, 3-4x/week

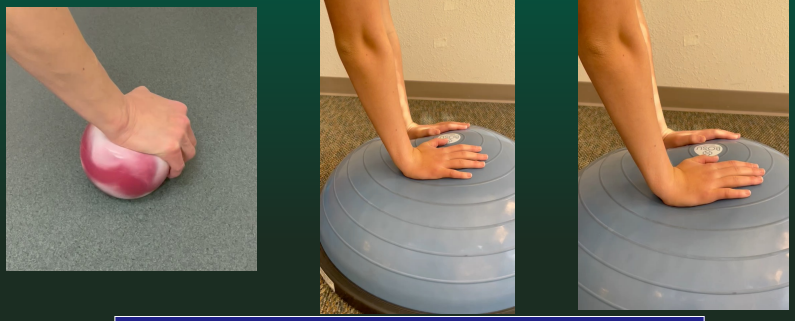
Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

92

Stage 4: Movement normalization & functions

Progress with Weight Bearing

Using weighted ball or Bosu ball (or similar)



10-20 repetitions x 3 sets, 3-4x/week

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

93

Stage 4: Movement normalization & functions

Resistive Coordination

PNF patterns with resistive band

10-20 repetitions x 3 sets, 3-4x/week

Chen Z. Clinical evaluation of a wrist sensorimotor rehabilitation program for triangular fibrocartilage complex injuries. Hand Ther. 2021 Vol. 26(4): 23-133.

94

Stage 4: Movement normalization & functions

Resistive Coordination

PNF patterns with resistive band

95

Summary

- There are multiple pain-generators that can occur at the ulnar wrist, clinical testing can better isolate the involved structure
- Address any other concomitant soft tissue disorders involving ECU
- Proprioceptive retraining can be beneficial in restoring the patient's function!
- These patients don't need to be seen very frequently in the clinic for the proprioceptive training, most of it can be done with a home program ☺

96

97