



Ax of the Hand/Wrist & Elbow

Mechanical Specific Pathology & Treatment



Outline

Hand/Wrist & Elbow Theory –

- Anatomy & Pathology

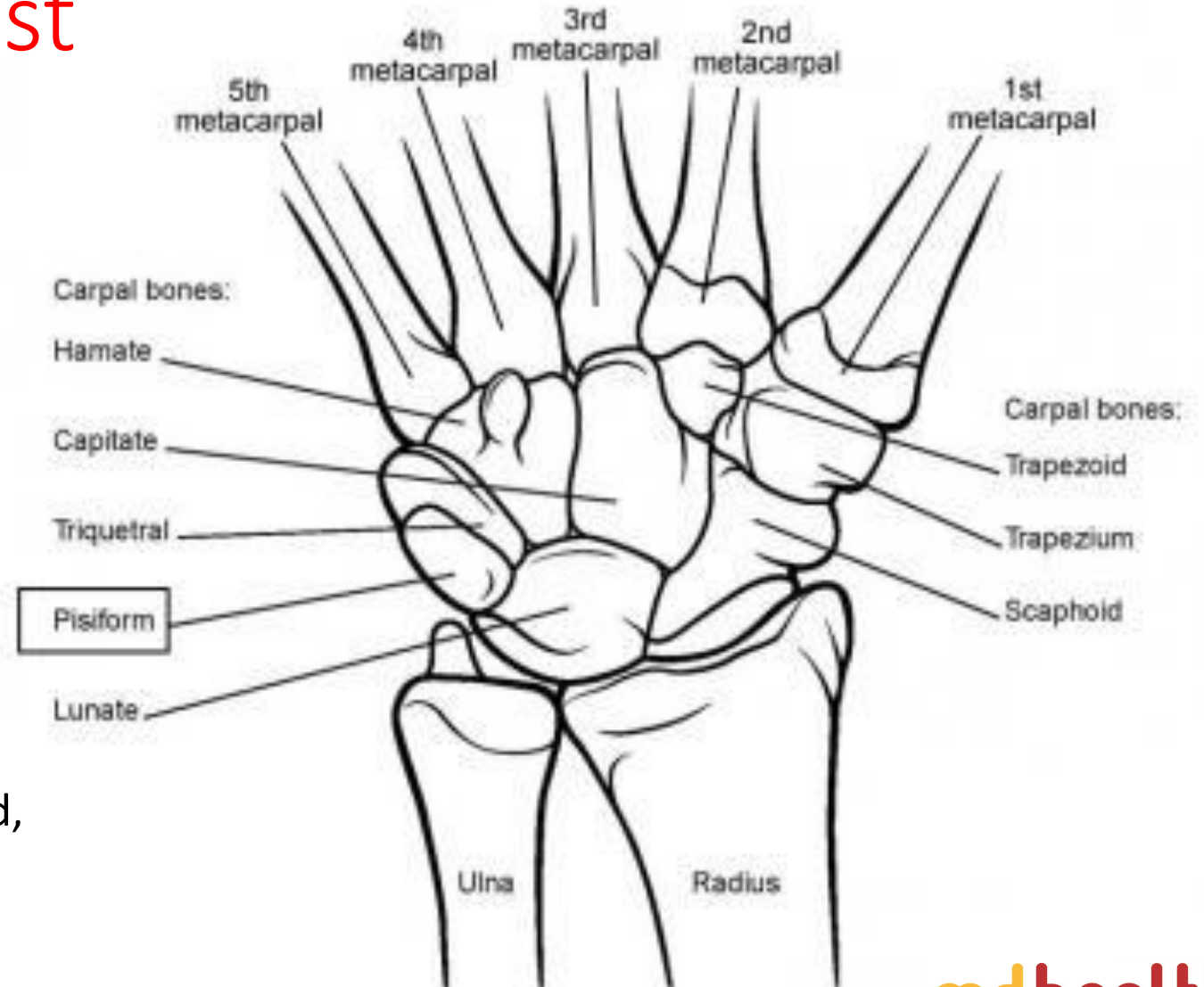
Assessment (Demonstration with slides) –

- Range & quality of movement
- Palpation
- Special Tests
- Ax for #

Significant Findings & Treatments

Anatomy of the Wrist

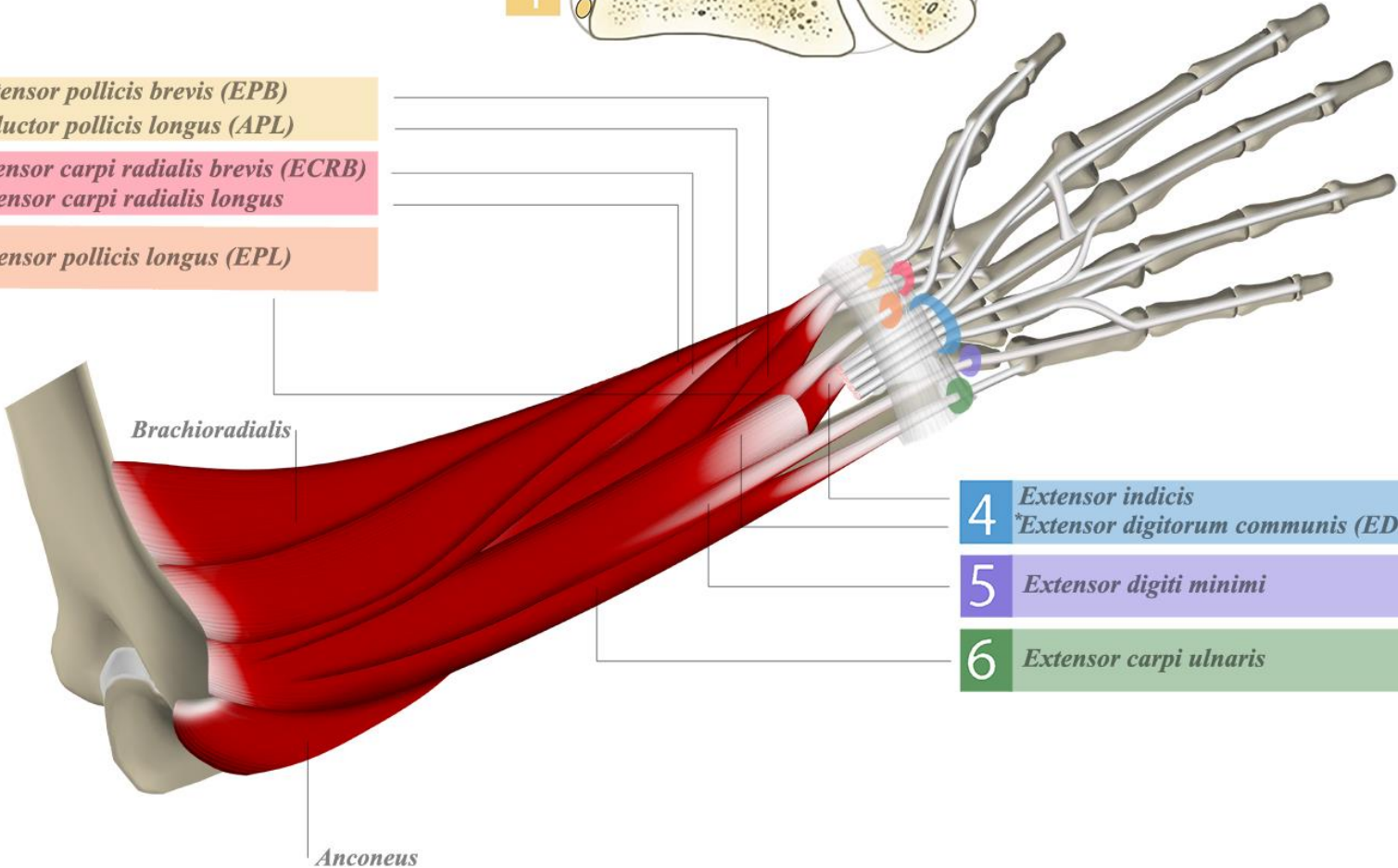
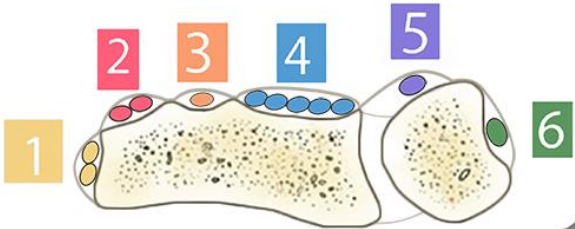
- Divided into 3 major components
 - Distal radioulnar
 - Radiocarpal
 - Midcarpal
- Bones comprising of the wrist;
 - Radius
 - Ulna
 - Carpal bones;
 - Proximal row (scaphoid, lunate, triquetrum, ?pisiform)
 - Distal row (trapezium, trapezoid, capitate, hamate)
 - Bases of the metacarpals



Extensor Compartment of the Wrist/Elbow

Extensor compartment of the wrist

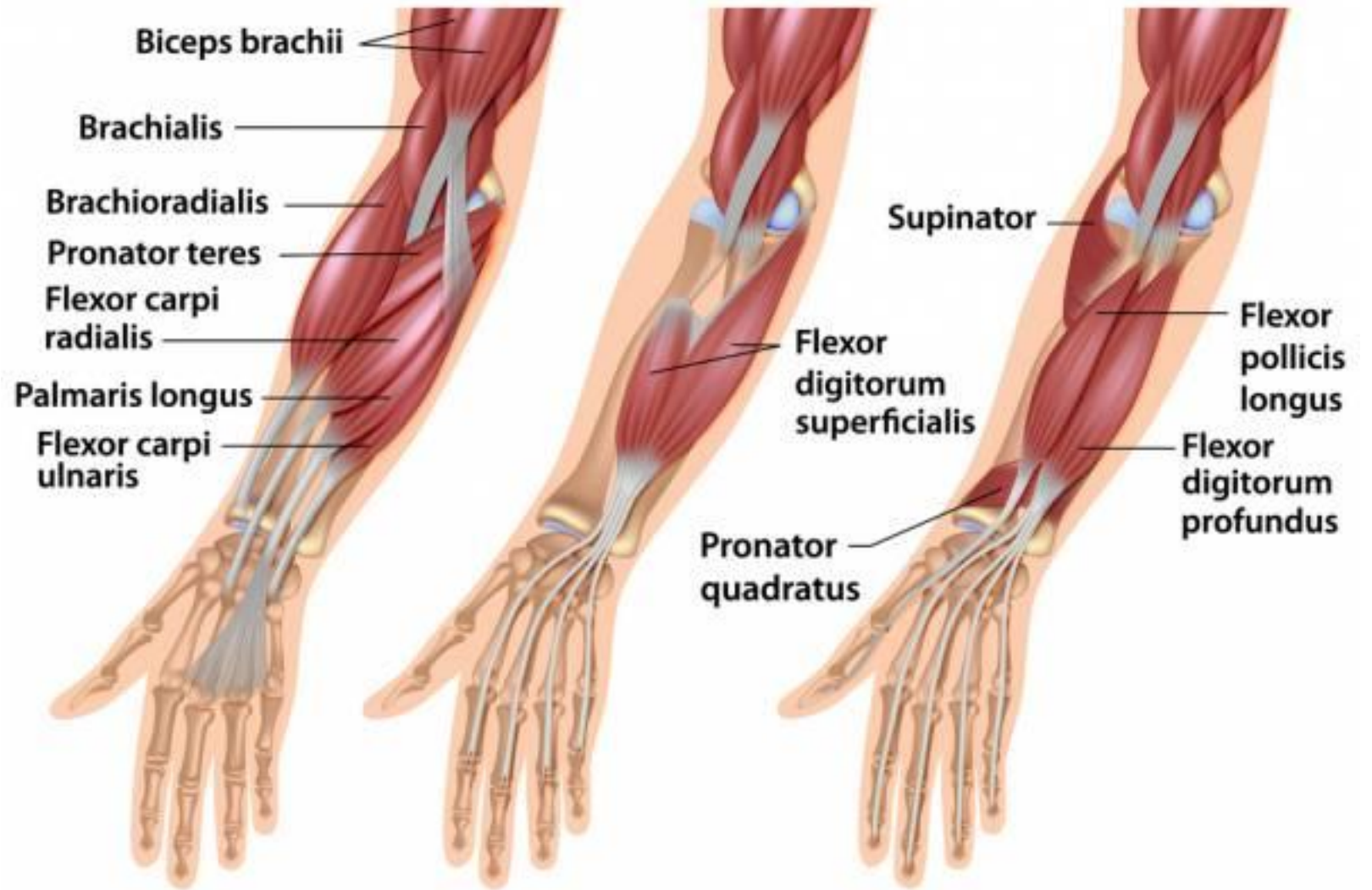
- 1 Extensor pollicis brevis (EPB)
Abductor pollicis longus (APL)
- 2 Extensor carpi radialis brevis (ECRB)
Extensor carpi radialis longus
- 3 Extensor pollicis longus (EPL)



- 4 Extensor indicis
*Extensor digitorum communis (EDC)
- 5 Extensor digiti minimi
- 6 Extensor carpi ulnaris

*Extensor digitorum communis cut to show extensor indicis beneath

Flexor
Compartment
of the
Wrist/Elbow



Common Pathologies



OA (1st CMCJ)

- Arthritis occurring at the base of the thumb (carpometacarpal joint)
- Damage to the joint surfaces decreases the articular surface area, thereby limits ROM
- Decline in ROM and strength = difficulty in gripping objects or loading



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IMAGE: <https://www.mayoclinic.org/diseases-conditions/thumb-arthritis/symptoms-causes/syc-20378339>

Instabilities/Dissociations

- Occur when there has been injury to ligaments or other passive structures.
- Many do not appear on imaging until they have progressed significantly. At the point when they can be seen on imaging they are known as “static instabilities”. Once dissociations have progressed beyond a certain point, secondary changes will occur which may be irreversible. **Hence, an accurate physical examination is crucial** to detect dynamic instabilities before they progress further.
- They may often occur in conjunction with other injuries (e.g. fractures), or often multiple instabilities will be present at the same time.



IMAGE: https://www.physio-pedia.com/Scapholunate_Dissociation

Scapholunate (SL) Dissociation

- Complete tear of scapholunate interosseous ligament.
- Also requires impaired secondary restraints (extrinsic ligaments)
- Occurs when there is a tear in the scapholunate ligament
- Scaphoid may sublux dorsally from scaphoid fossa when gripping/overloaded
- In chronic scapholunate instability, the first bony change will be osteoarthritis of the dorsal aspect of the rim of the radius (as the proximal pole of scaphoid glides dorsally, being no longer anchored to the lunate).
- On imaging >3mm of separation between scaphoid and lunate is deemed abnormal

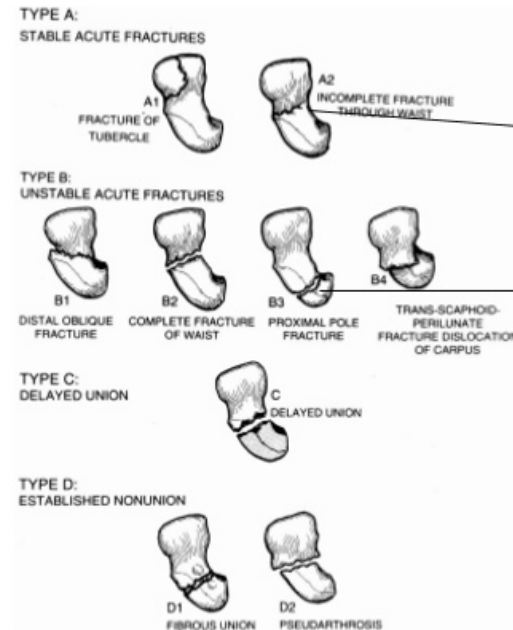
Lunotriquetral (LT) Dissociation

- Complete tear of lunotriquetral ligament
- Triquetrum moves with distal carpal row
- Triquetrum flexes and supinates
- Requires triquetral extension and pronation to reduce the gap

Scaphoid Fracture

- 70-80% of carpal #
- More common in adolescents and young adults
- Mode of impact: Fall on outstretched hand (FOOSH)
- Location of #:
 - Waist (middle) 70-80%
 - Proximal pole 20%
 - Distal Pole 10%
- Blood supply enters distally
 - Poor healing capacity for proximal #
 - The more distal the #, the better the chances of union

Herbert Classification



→ 95% healing rate with 10-12 weeks immobilisation

→ 80% result in avascular necrosis

• Any fracture with >1mm displacement has a 55% chance of non-union

Distal Radioulnar Joint (DRUJ) Instability

- “Cylinder” joint, where radius rotates longitudinally around the head of the ulna
- Dorsal superficial ligament most commonly injured (FOOSH – wrist ext & pronation)
- Signs of poor joint congruence
- Sx ; p+ clicking with rotation, weakness, reduced forearm rotation
- Ax static & dynamic stability
 - Interosseous membrane (longitudinal stability)
 - Extensor Carpi Ulnaris (ECU)
 - Pronator Quadratus (PQ)



IMAGE: <http://52.62.202.235/upper-limb/wrist/druj/-tfcc/druj-instability>

TFCC (Triangular Fibrocartilage Complex) Tear

- Cartilaginous structure on the ulnar (median) side of the wrist
- Helps facilitate pronation/supination of forearm by providing a strong but flexible connection of the radius to the ulna
- Has connections to radioulnar ligament and may occur concomitantly with pathologies of the DRUJ
- Sx: ulnar sided wrist pain near the ulnar head, particularly during pushing/weight bearing and ulnar deviation – pain may also be present with pronation/supination movements.
- Assessment: Ulnar-carpal stress test and press test
 - Ulnar-sided wrist musculature (including ECU)
 - Dynamic stabilisers of DRUJ (PQ)

Extensor Carpi Radialis Brevis Tendinopathy

Mechanism

- Acts eccentrically over wrist and elbow
- Breakdown of the ECRB tendon 1-2 cm below origin, can extend into partial tear
- Additional stress is applied by head of radius which rotates anteriorly, compressing ECRB

Symptoms

- Lateral forearm pain, into the proximal forearm
- Present with wrist extension or gripping

Treatment

- Conservative
 - Restore full wrist extension range (Increased load on ECRB)
 - Strengthen the wrist extensors
 - Improve predisposing bio-mechanics (Strengthen the shoulder muscles, treat Cx & Tx spine)
 - Steroid – into the paratenon only!!!!
 - Botox ?
- Surgical
 - Debridement surgery if conservative treatment fails after 12 months

Pronator/Flexor Tendinopathy

Mechanism

- Tendinopathy of the pronator teres tendon, below the medial epicondyle
- Tennis players with a lot of top spin during forehands or golfers who hit the ground a lot

Symptoms

- Pain in the medial elbow with pronation and wrist flexion

Treatment

- Conservative
 - Restore full wrist flexion range
 - The rest the same as extensor tendinopathy
- Surgical
 - Debridement surgery if conservative treatment fails after 12 months

De Quervain's Tenosynovitis

Mechanism

- Inflammation of the synovium of the Abductor Pollicis Longus
- Repeat hyperabduction of the thumb – of the left hand with a right handed golfer

Symptoms

- Local swelling and tenderness
- Positive WHAT & Eichhoff's Test (Finklestein's)

Treatment

- Conservative –
 - Splint and rest (14% success)
 - Cortisone and Local anaesthetic (85% success)
 - Gradual return to strengthening and stretching?

Carpal Tunnel Syndrome

- Compression of the median nerve at the Carpal Tunnel
- Generally experience burning volar pain in the distribution of the median nerve (at and/or distal to carpal tunnel) or nocturnal paraesthesia (tingling & numbness at night)
- Can manage conservatively initially via cortisone injection or surgical release. Neurodynamic exercises may be effective in less severe cases.



IMAGE: <https://imovephysio.com.au/carpal-tunnel-and-de-quervains-the-new-mums-wrist/>



Assessment

Ax Process

- Subjective

Mode of injury, traumatic vs atraumatic, sudden vs insidious, area/intensity of pain, aggravating/easing factors

- Look, Feel, Move*

Look

Observe wrist for deformity, swelling, colour (blood flow/inflammation), tone of thenar/hypothenar eminences, scarring (#s etc.)

Feel

Palpation discussed in more detail later

Move

ROM (flexion/ext, ulnar/radial deviation. Don't forget pronation/supination and movement of fingers/thumbs, including opposition/apposition when necessary).

Special tests

*Palpation

- Bones & joints
- Tendons
- Forearm & hand muscles



*Appendix 1 – Bony Surface Anatomy

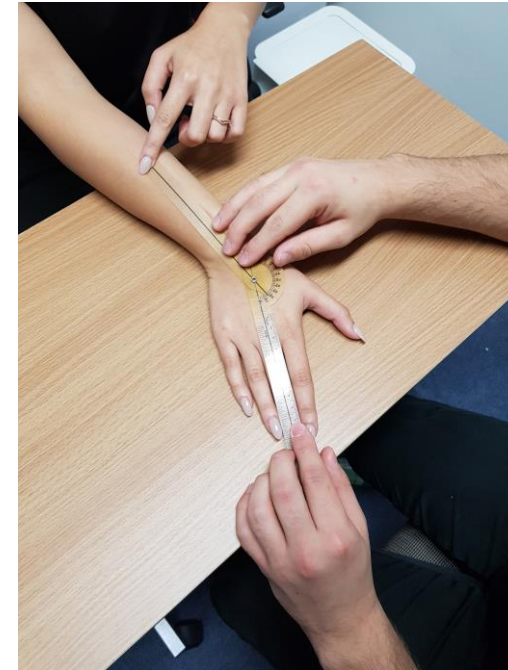
Radial Styloid	Hand shake position: Most distal point of radius on lateral border forearm
Scaphoid	Base of the anatomical snuff box
First CMCJ	Palpate down first MC in line with radial styloid to the joint line
Trapezium & Trapezoid	Form proximal bony shelf of 1 st CMCJ. Trapezium most lateral.
Listers Tubercle	Palm down: Start at radial styloid. Move finger width prox & x2 finger widths ulnarly
SLJ	Slightly towards the thumb, flex & deviate wrist slightly to establish the joint (feel for a ganglion).
Lunate	Immediately distal to the Listers
2nd CMCJ, Trapezoid & Capitate	Feel down 2 ^{nc} MC to the 2 nd CMCJ, articulating with Trapezoid & Capitate
DRUJ	Palpate down forearm along inner surface of the ulna
Triquetral, LTJ	LTJ immediately distal to the DRUJ. Triquetral immediately distal the ulnar styloid.
Ulnar Styloid	Prominent
Ulnar Notch	Arm resting position: Distal end of the ulna on medial border of the forearm
Pisiform	Palm up: Easily palpable with wrist held passively in flex
Hook of Hamate	Place examiners thumb IPJ on pisiform & direct your thumb towards MF to land on landmark
Volar Distal Radius	Palpate across & down from radial styloid
Scaphoid Tubercle	Immediately distal to the end of the volar radius, in line with FCR. More prominent in RD.
Volar CMCJ	Palpate around from dorsal CMCJ, moving across thenars

*AROM with Goniometer

PRONATION/SUPINATION



DEVIATION

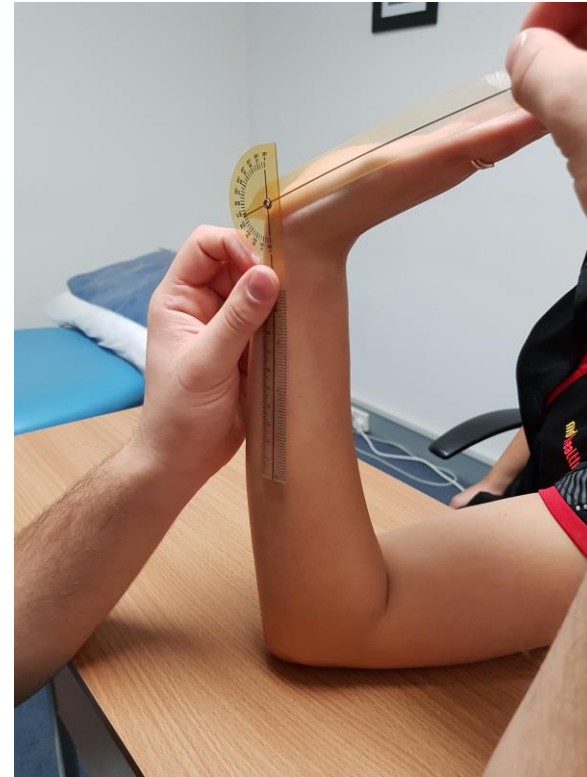


*AROM with Goniometer cont.

FLEXION



EXTENSION



*AROM with Goniometer cont.

CMCJ ANGLE

- Measurement of severity & progression of OA CMCJ thumb
(may be a negative number)



SPECIAL TESTS

Traction Shift Test – CMCJ

Specificity (100%); Sensitivity (67%)

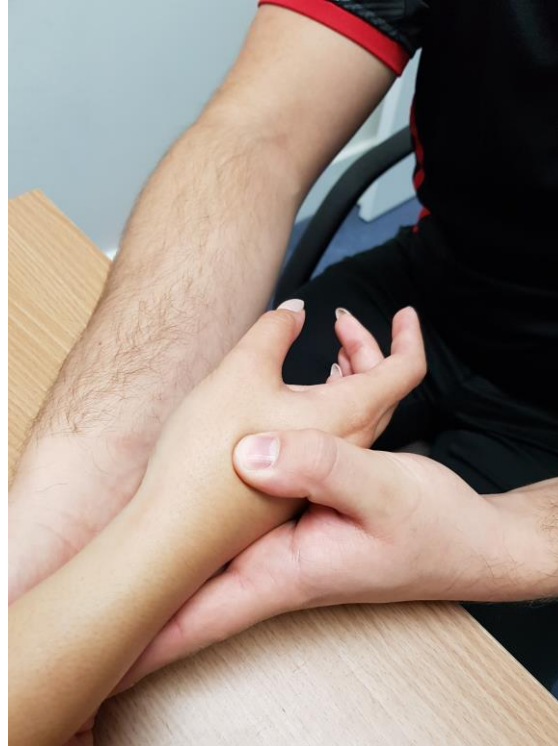
- Traction then push down
- Comfortable for the client
- +ve (painful and/or
subluxation/relocation of CMJC)
= potential developing OA within
CMCJ!!



Adduction & Extension Tests – CMCJ

Specificity (81%); Sensitivity (94%)

- Also for Ax of CMCJ
- Signs of potential OA



Watson's Test- SL instability

Sensitivity (78%); Specificity (57%)

SL ligament integrity

- +ve = clunky & painful
- Proximal pole glides back
- If not, can lead to potential OA



Lunotriquetral Ballotment Test (Reagan's Test) – LT instability

- Stabilise the lunate and move the triquetrum and glide pisiform anterior-to-posterior
- Feel for laxity of the lunotriquetral ligament
- Gr1-4 laxity



DRUJ Instability – Distal Radioulnar Joint

- Three positions (mid-prone, pronation, supination) +/- deviation
- Translation of ulna head
- Sighting for laxity or nil



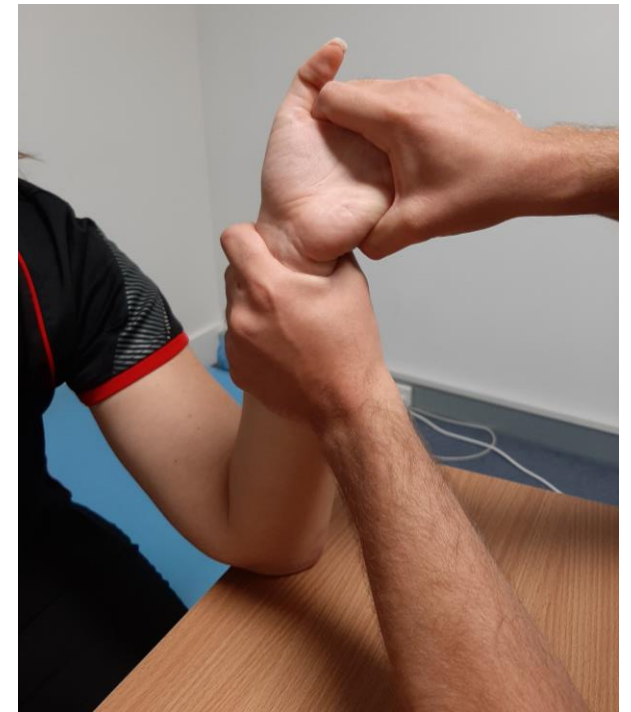
TFCC tests

Press test (*100% sensitivity, low specificity*)

- Patient presses hands into table or plinth and stands up using hands to assist. Ulnar-sided pain=positive

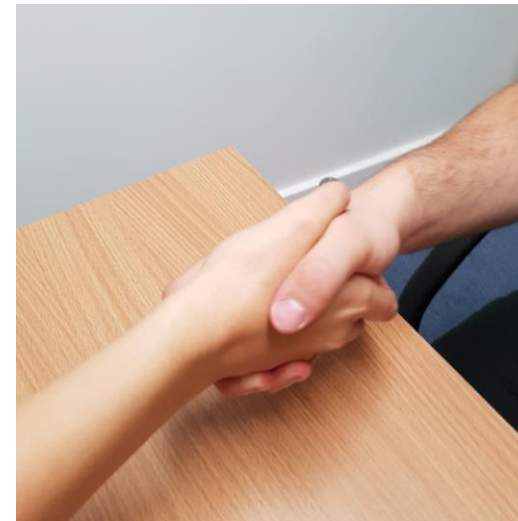
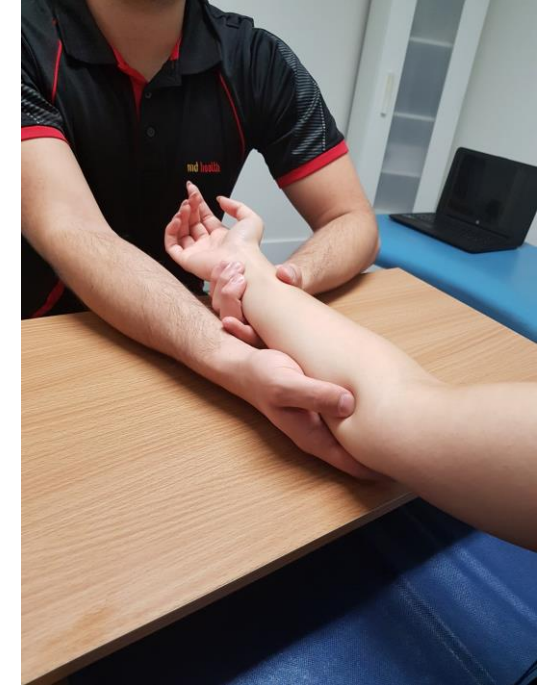
Ulnocarpal stress test

- Like the McMurray's test but for the wrist.
- Start dorsoradially, move ulnarly, then once you get to the ulnar side, move volarly
- Pain positive
- May indicate TFCC, LT, ulnocarpal abutment syndrome, arthritis or a joint mouse.
- Reasonable sensitivity, low specificity



ECRB & Pronator Teres

- Tender 1-2 cm distal to lateral epicondyle
 - Reproduced with resisted wrist extension, pronation and radial deviation
 - Reproduced with resisted 3rd digit extension (as it anchors the 3rd metacarpal)
-
- Tenderness distal to the medial epicondyle
 - Pain on resisted wrist flexion and pronation
 - Dural tension in median n. as passes through the 2 heads of pronator teres



WHAT test – De Quervain's

Wrist in full flexion (within pain) and thumb in full abduction and extension. Examiner applies increasing abduction resistance to thumb

- P = Pain
- N = Normal

99% sensitive, 29% specific



Eichhoff's Test (Finklestein's) – De Quervain's

Sensitivity (.89%); Specificity (.14%)

- Ax of De Quervain's
- High false positives
- Need to think more subjectively when diagnosing



Durkan's with Phalen's – Carpal Tunnel Syndrome

Sensitivity (96%); Specificity (80%)

- Examiner presses thumb over carpal tunnel
- Wrists maintained at 90 degrees flexion



Scaphoid #
Suspicion –
Most
common

OBJECTIVE TESTS

- Snuffbox tenderness (ASB)
Sensitivity (0.87-1.0); Specificity (0.03-0.98)
- Longitudinal thumb compression (LTC)
Sensitivity (0.48-1.0); Specificity (0.22-0.97)
- Scaphoid tubercle tenderness (STT)
Sensitivity (0.82-1.0); Specificity (0.17-0.57)
- Pain on Ulnar Deviation (PUD)
Sensitivity (0.67-1.0); Specificity (0.17-0.60)

COMBINED TESTS

- ASB + LTC + STT
Sensitivity (1.0); Specificity (0.75)
Post test Probability (64%)
- ASB + PUD
Sensitivity (1.0); Specificity (0.45)

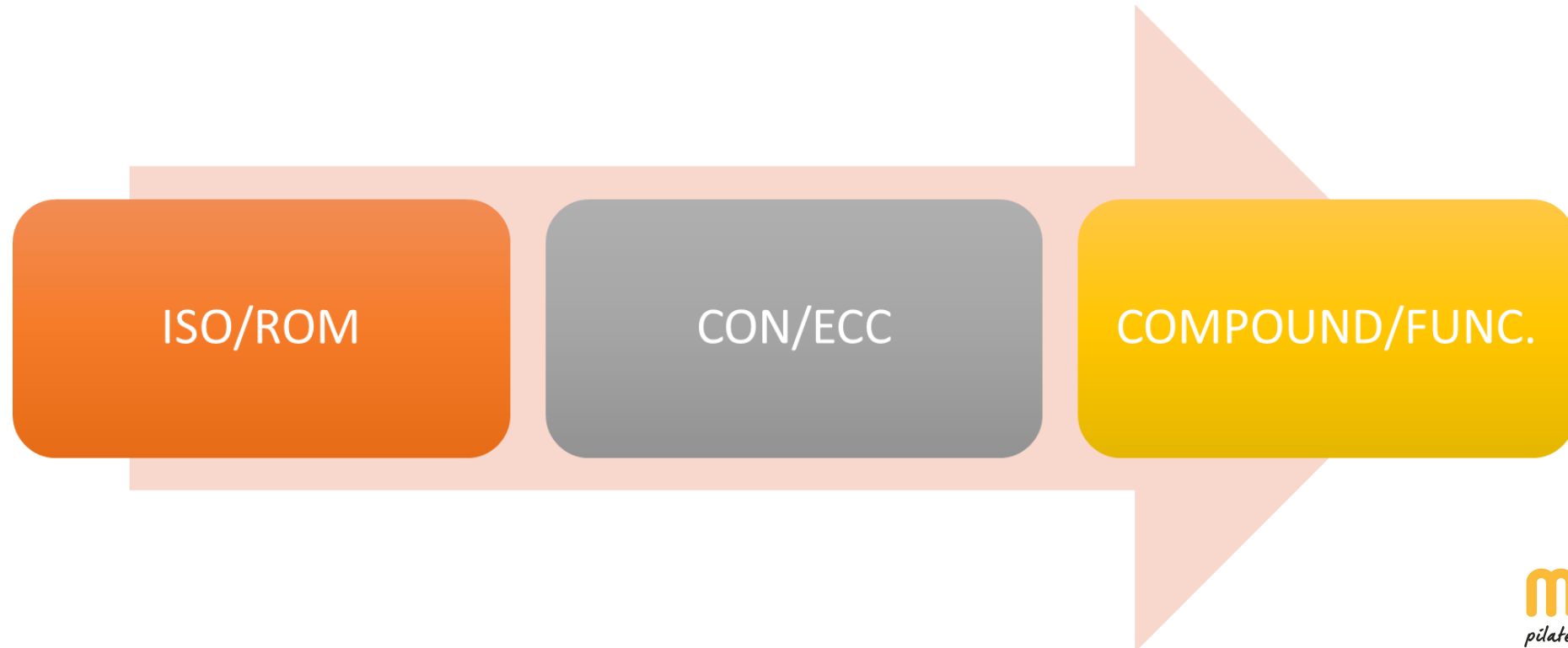
Management & Treatment



Exercise for Tendonopathies

General Tendon protocols:

- Start with isometrics – 2 weeks (4 sessions) of no more than 2-3/10 pain increase from base levels then next day
 - Then progress to conc/eccentric (with same rules), but return to isos if flare up
- Can do stretches but at end of session once done strengthening (Strengthening more important)



Exercise for Tendonopathies

Muscle groups	ISO's	Conc/ecc instructions	Mobilise	Other	
ECRB	Wrist extension at 20 degrees with bent elbow	40 degrees extension to 20 degrees flexion	Wrist extension mobilisation if don't get 70 degrees	Rot Cuff strength – use strap above wrist	Check desk ergonomics
Supinator	Wrist neutral to 45 degrees supination (1/2 their ROM) with bent elbow		Mobilise supinated wrist radial head downwards if don't get 7-8/10 ROM		
Pronator teres	Wrist neutral to 45 degrees pronation (1/2 their ROM) with bent elbow		Mobilise pronated wrist radial head downwards if don't get 7-8/10 ROM		

Exercise Theory for Wrist Issues - Instability

Activate the muscles that reduce the “gapping” at the joint.

Avoid activating muscles that increase the “gapping” at the joint.

For scapholunate: Activate muscles that supinate the wrist

For lunotriquetral: Activate muscles that pronate the wrist

Supinate wrist (to treat SL)	Ulnar side flexors
	Radial side extensors
Pronate wrist (to treat LT)	Ulnar side extensors
	Radial side flexors

Specific Exercises

Scapholunate Instability

- Activate muscles that supinate wrist – radial sided extensors and ulnar-sided flexors
 - EPL, AbPL, ECRL
 - FCU
 - FCR*

Summary:

- Supinate
- Straight to concentric eccentric

*Important exception to the rule: FCR

Although FCR is a pronator of the carpus, due to its anchoring attachment to the scaphoid tubercle, it SUPINATES the scaphoid, whilst pronating the rest of the wrist. This has the effect of bringing the scaphoid and lunate closer together, thus “closing the gap”.

Specific Exercises cont

Lunotriquetral Instability

- Activate muscles that pronate the wrist – ulnar sided extensors and radial sided flexors
 - ECU, FCR

Summary:

- Pronate
- Straight to concentric eccentric

Thumb OA (1st CMC)

- Traction mobilization
- Strengthen thumb abd and extension

Specific Exercise cont.

DRUJ

- Supination & pronation
- Concentric/eccentric straight away

TFCC

- ECRB protocol & pronation?
- Additionally, hypothenars for TFCC (supports ulnar-sided carpus)

De Quervains

- CSI (with ASD)
- ISO thumb abduction & extension
 - With elastic/rubber bands

Carpal tunnel

- CSI (with ASD)

Acute Injury (Scaphoid #)

Mode of impact = Fall on outstretched hand (FOOSH)

Imaging

- X-ray 16-27% false negative findings
 - (will not portray initially – repeat 10-14 days post)
- 6-view X-Ray

Conservative Management

- Immobilisation in wrist/thumb cast ~6wks
- If no 'clinical union' repeat x-ray & immobilise further 2 wks
- Repeat until 12 wks

Casting

- 6wks is enough in 80% of non-displaced scaphoid waist #
(ReAx every 2wks up until 12wks, ? consider surgery)

Surgical Management