

Updates in Management of Upper Extremity Conditions for the Primary Care Provider

February 11, 2023

Presented by: Gina DeFranco, DO

Associate Professor and Chair of Family Medicine

LMU

DeBusk College of Osteopathic Medicine
LINCOLN MEMORIAL UNIVERSITY

Objectives

- Recognize typical presentation of common upper extremity musculoskeletal conditions
- Evaluate the joints of the upper extremity in a systematic fashion
- Recommend evidence-based evaluation and intervention for common upper extremity musculoskeletal conditions
- Recognize when to refer patients with upper extremity musculoskeletal conditions to sports medicine or orthopedics
- Apply an osteopathic approach to diagnosis and treatment of upper extremity musculoskeletal conditions

Disclosure

- I have no actual or potential conflict of interest in relation to this program/presentation.

slido



**Join at slido.com
#7405813**

ⓘ Start presenting to display the joining instructions on this slide.

Common conditions by joint

Shoulder

- Rotator cuff tendonopathy
- Subacromial impingement syndrome

Elbow

- Epicondylitis
- Olecranon bursitis

Wrist

- Carpal tunnel syndrome
- DeQuervain tenosynovitis

Hand

- CMC arthritis
- Phalangeal fractures

Overview of Screening Musculoskeletal Exam

Inspection

- Deformity, visible swelling, muscle atrophy

Palpation

- Tenderness, swelling, crepitus

Active and Passive ROM

Special Tests specific to suspected condition

Muscle Strength Testing (as applicable)

slido



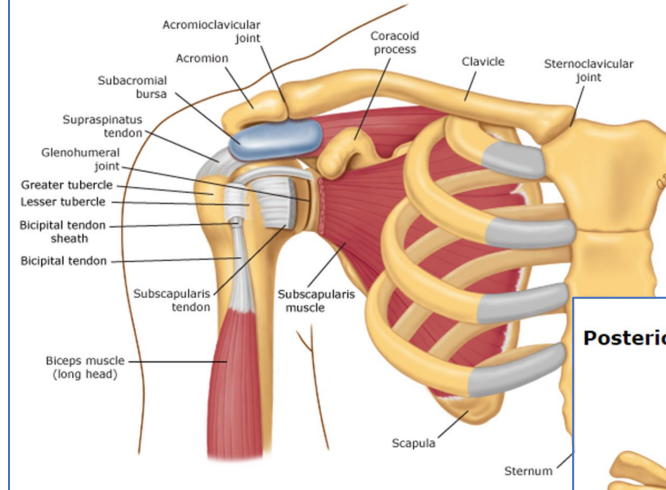
What is your confidence level in evaluation of the shoulder?

ⓘ Start presenting to display the poll results on this slide.

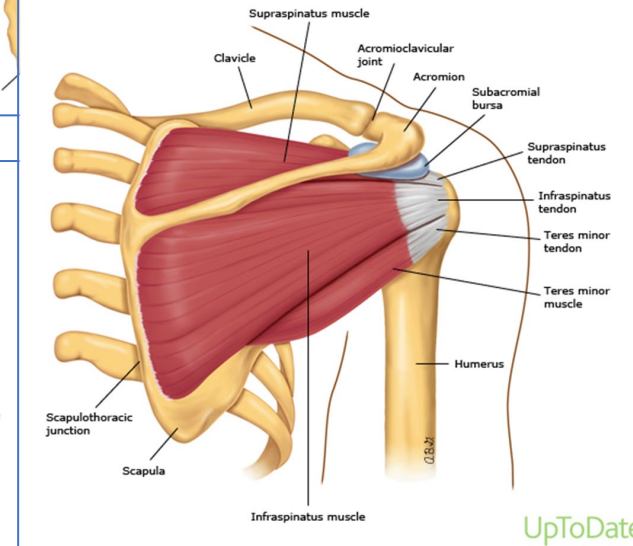
Shoulder Anatomy and Mechanics

Ranges of Motion	Rotator Cuff	AC joint
Forward flexion	Supraspinatus: Abd, Ext rot, stabilization	Clavicle
Extension	Infraspinatus: Ext Rot	Acromion
Abduction	Teres Minor: Ext Rot/Abd	Coracoid process
Adduction	Subscapularis: Int rot	Ligaments
Internal/External rotation		
Scapular protraction/retraction/elevation/depression		

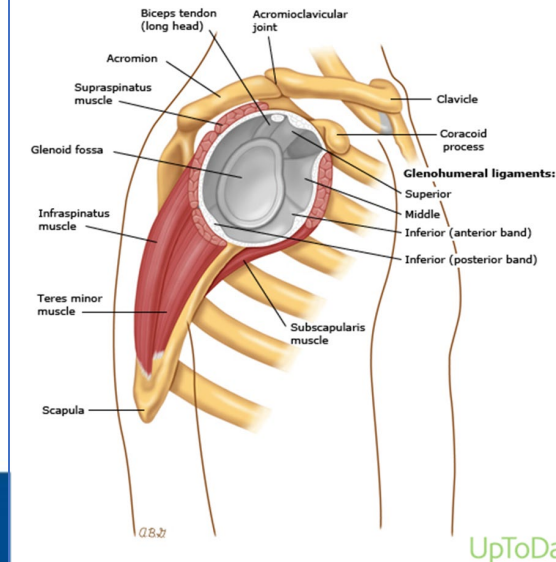
Anterior view of shoulder anatomy



Posterior view of shoulder anatomy



Lateral view of shoulder anatomy



Shoulder evaluation

- Inspection
 - Posture
 - Muscle atrophy?
 - Skin
 - General Assessment
- Palpation
 - Systematic, comparative
 - Directed towards complaint/suspected issue
- ROM
 - Limited active ROM
 - Limited passive ROM
 - What plane? To what extent?
 - What is THEIR normal?
- Isometric strength and special tests
- Cervical spine exam

Shoulder evaluation – special tests

Rotator Cuff Pathology

- Supraspinatus
 - Painful arc: active abd. $> 90^{\circ}$
 - Drop arm test: Cannot maintain steady lowering of both arms once passively abducted
 - Jobe's test (empty can)
- Subscapularis
 - Lift-off test
- Infraspinatus/Teres Minor
 - Resisted external rotation in adduction (elbow at the side)
 - Hornblower's sign
 - Patte's test

Subacromial Impingement

- Neer's sign
 - Passive forward flexion of the shoulder while preventing elevation of the acromion
- Hawkins-Kennedy sign
 - Forward flex shoulder to 90° , flex elbow to 90° . Stabilize shoulder with one hand and passively internally rotate the shoulder with the other

Supraspinatus Tendinopathy Tests

Jobe's test of supraspinatus strength



Jobe's test (or the "empty can" test) assesses supraspinatus function. The patient places a straight arm in about 90 degrees of abduction and 30 degrees of forward flexion, and then internally rotates the shoulder completely. The clinician then attempts to adduct the arm while the patient resists. Pain without weakness suggests tendinopathy; pain with weakness is consistent with tendon tear.

Courtesy of Stephen Simons, MD, J Bryan Dixon, MD, and David Kruse, MD.

UpToDate®

Push off or Gerber's test

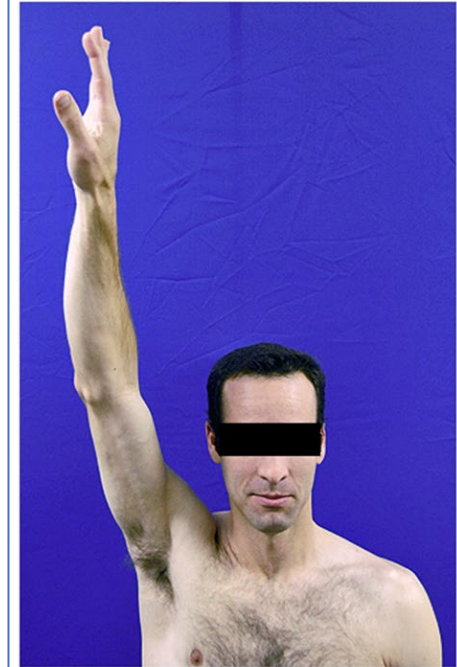


The subscapularis is the rotator cuff muscle primarily responsible for internal rotation. Its strength can be assessed using the push-off, or Gerber's, test. This test is performed by having the patient place one hand behind his back and push posteriorly against resistance.

Courtesy of Stephen Simons, MD, J Bryan Dixon, MD, and David Kruse, MD

UpToDate®

Painful arc sign for rotator cuff pathology



Pain with active abduction beyond 90 degrees (ie, painful arc sign) suggests rotator cuff tendinopathy. The test is most useful when combined with other rotator cuff tests, such as the Neer and Hawkins-Kennedy tests.

Courtesy of Stephen Simons, MD, J Bryan Dixon, MD, and David Kruse, MD.

UpToDate®

Subacromial Impingement Tests

Hawkins Kennedy test for shoulder impingement

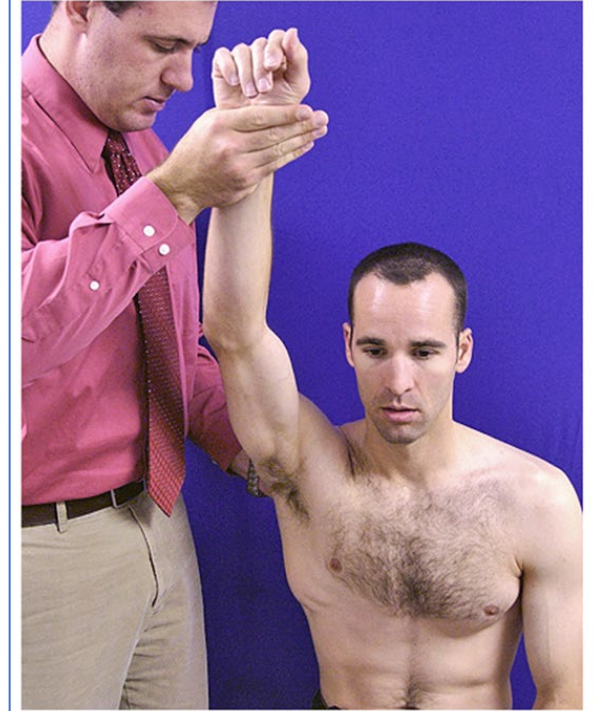


The Hawkins Kennedy test is used to assess shoulder impingement. In this test the clinician stabilizes the shoulder with one hand and, with the patient's elbow flexed at 90 degrees, internally rotates the shoulder using the other hand. Shoulder pain elicited by internal rotation represents a positive test.

Courtesy of Stephen Simons, MD, J Bryan Dixon, MD, and David Kruse, MD.

UpToDate®

Neer test for shoulder impingement



The "passive painful arc maneuver" shown above involves passively flexing the glenohumeral joint while simultaneously preventing shoulder shrugging. The test is often referred to as the Neer test, and is used to assess shoulder impingement.

Courtesy of Stephen Simons, MD, J Bryan Dixon, MD, and David Kruse, MD.

UpToDate®

slido



Who is most likely to have rotator cuff issues?

ⓘ Start presenting to display the poll results on this slide.

Subacromial Impingement and Rotator Cuff Tendinopathy

- Compression of supraspinatus tendon, subacromial bursa, long head of the biceps are between the acromion and humeral head
- Incidence increases with age (62% over age 80) and is associated with manual labor (especially overhead repetitive motion) and overhead athletics
 - Drywall installation; auto mechanic; painter; delivery driver; box store stock room
 - Baseball; tennis; swimming; golf; gymnastics; volleyball
- Anatomic risk: poor mechanics (scapular instability/dyskinesis); postural alignment; core strength; acromial structure

Subacromial Impingement and Rotator Cuff Tendinopathy

- Motions that lead to subacromial compression or result in dynamic eccentric load of the rotator cuff
- Over time, subacromial impingement syndrome can lead to rotator cuff tendinopathy
- Rotator cuff tear – partial or full:
 - Overuse (see above)
 - Acute injury or acute on chronic

Subacromial Impingement

Presentation

- Pain with over head activity
- Pain in the lateral deltoid area/arm
- Pain at night when lying on affected shoulder

Typical findings

- Neck exam within normal limits.
- Subacromial tenderness
- Positive painful arc (glenohumeral motion limited by pain)
- Pain reproduction with impingement tests
- Possible atrophy of posterior shoulder muscles

Subacromial Impingement/Rotator Cuff Tendinopathy - Diagnostic Imaging

- Plain radiographs
 - Evaluation of acromion pathology
 - Evaluation of AC joint
 - Critical Shoulder Angle
 - Angle between glenoid fossa plane and a line drawn from the inferior edge of the glenoid to the lateral edge of the acromion on AP view
 - Normal 30-35°; OA <30°; RTCP >35°
- Ultrasound
 - Superficial tendon and muscle issues
 - Bursitis
 - Necessitates an experienced user
- MRI
 - No subjective or objective improvement with conservative therapy.
 - Diagnosis remains unclear
 - Tear of rotator cuff or labrum is suspected clinically
 - Biceps tendon injuries



Subacromial Impingement/Rotator Cuff Tendinopathy

- Ice
- REST!!!!
- Scheduled NSAIDs (if able to tolerate/no contraindications)
 - Topical and/or oral
- Physical therapy program with REST from sport/activity
 - Restore mobility; then increase stability/strength; then functional training
 - Gradual return to activity sport if improvement in symptoms and function after a several (4+) weeks of physical therapy
 - Full course of physical therapy may require several months
- Subacromial injection: glucocorticoid and analgesic as adjunct to physical therapy *if necessary*
 - AVOID in suspected rotator cuff tear; can affect surgical outcome

Common ergonomic problems causing shoulder impingement

	Problem	Remedy
Desk-related	Keyboard/mouse too far from torso; causes repeated and prolonged shoulder flexion	Position keyboard closer and/or move chair closer to desk; elbows should align with trunk and rest at 90-degree angle.
	Armrests too lateral; causes shoulder abduction and internal rotation	Position armrests closer to torso or avoid using armrests and keep elbows by side.
	Desk chair too low; causes thoracic flexion/slouching and shoulder flexion when typing or using mouse	Raise desk chair so hips are slightly above knees. This promotes more upright posture and allows elbows to be kept at 90 degrees of flexion when typing.
	Keyboard, mouse, or writing area to side of computer; leads to repetitive cross-body reaching (adduction) or lateral reaching (abduction)	Position monitor, keyboard, and mouse directly in front. When writing, use a clipboard or place paper/tablet as close to midline as possible.
ADL-related	Movements with shoulder extension and internal rotation (eg, putting on belt, tucking in shirt)	Perform tasks slowly. When tucking in a shirt, rotate trunk in the direction you are tucking to reduce shoulder extension.
	Taking off shirt by crossing arms, grabbing bottom, and lifting overhead	Remove one arm at a time, trying to keep arms out in front rather than to the side or overhead.
	Putting on bra	Position bra so a rear clasp is in front at breastbone, fasten, and then rotate.
	Crossing arms at rest; promotes shoulder internal rotation and scapular protraction	Position hands in pockets or clasped in the front of waist.
	Combination of horizontal adduction and internal rotation (eg, washing back); leads to impingement	Avoid reaching across your body to scrub the upper back; use a body brush with a long handle to reach those areas.
Driving-related	Driving with one hand on top of steering wheel; can cause shoulder flexion and internal rotation	Drive with both hands on the steering wheel; position hands at 9 and 3 o'clock or below.
	Reaching into back seat of car (especially to lift something)	Get out of the car and place or remove items on back seat. If you must reach into back seat, rotate trunk as much as possible before reaching.
	Putting on seatbelt; causes shoulder horizontal adduction and internal rotation	Rotate trunk and face towards direction of seatbelt. This reduces necessary shoulder motion.
Work- and activity-related	Movements with repeated internal rotation of flexed shoulder (eg, raking leaves, using a screwdriver)	Take short breaks. This reduces likelihood of overuse injury. Shorten the range of motion and alternate sides with tasks such as raking. Keep elbows close to body during these tasks. Perform recommended stretching exercises during breaks.
	Movements with internal rotation against resistance (eg, scrubbing countertops, washing windows)	Alternate arms; avoid using only dominant extremity. Perform small circular motions in both directions. Vary your movements: use up-down and side-to-side motions.
	Prolonged or repetitive overhead activity (eg, reaching up into cabinet, screwing in lightbulb, painting)	Use stepstool or ladder to reduce shoulder flexion. Take frequent, short breaks. Perform recommended stretching exercises during breaks.
Sleep-related	Sleeping supine or prone with arm overhead	Avoid prone sleeping position if possible. While supine, avoid sleeping with arm overhead.
	Sleeping on side with arm under the pillow	Thicker pillow improves cervical support and reduces tendency to put an arm under the pillow while sleeping.
Childcare-related	Holding/nursing baby causes protraction of scapulae, rounded shoulders, and horizontal adduction and internal rotation of shoulder	Movement variation is key. Alternate between sitting and standing. Periodically switch arms if able. Use body wraps and harnesses to reduce stress on shoulders and arms. When sitting, use a chair with good back support or place a pillow behind your back to promote upright posture. Use additional pillows under your arm to take some of the weight of the baby.

ADL: Activities of daily living

Subacromial Impingement/Rotator Cuff Tendinopathy - Referral

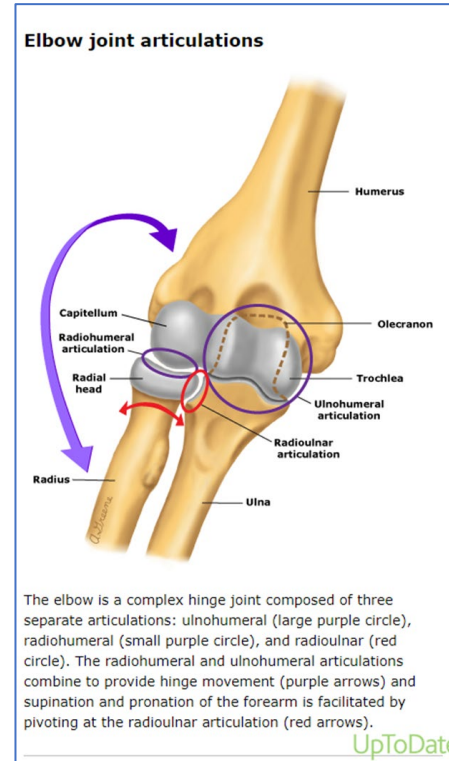
- If rotator cuff tear/labrum tear suspected with clinical or radiologic eval
- Functional deficits that interfere with activities of daily living
- Persistent pain and or worsening function
- Persistent activity limitations that prevent participation in desired activities or work
- Lower threshold for early referral in athletes
- Timing for referral varies – 6 weeks to 6 months

OMT for Shoulder Conditions

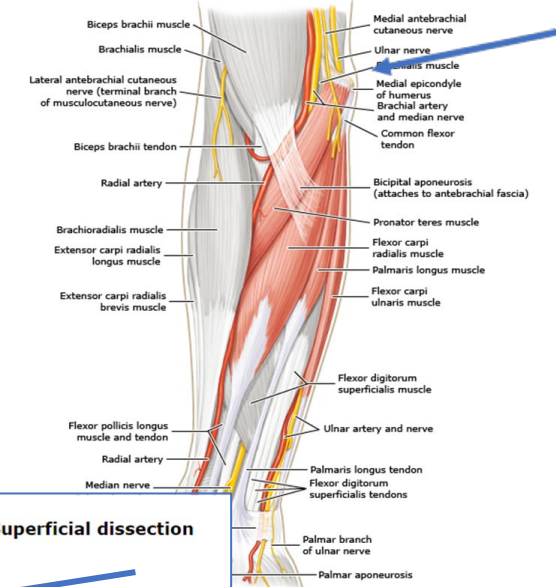
- Treat upper thoracic spine and ribs
 - Muscle energy
 - Still technique
- Traction and compression techniques
 - Glenohumeral balanced ligamentous tension
 - Shoulder girdle technique
- Seven stages of Spencer

Evaluation of the Elbow

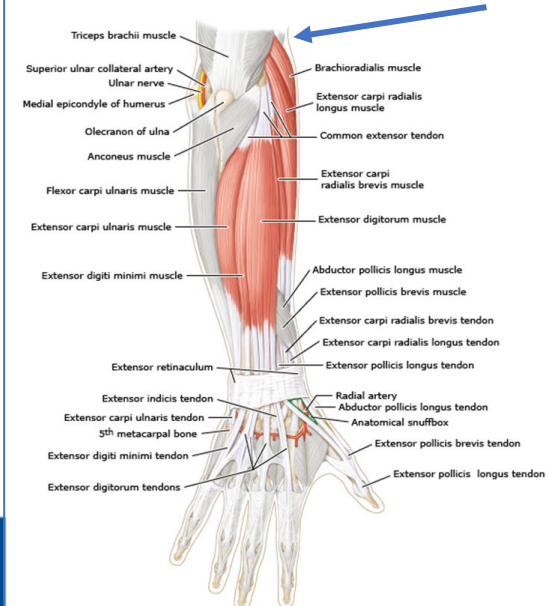
- Most elbow pain is related to conditions of periarticular structures
 - Epicondylitis
 - Olecranon bursitis
 - Nerve entrapment
- Complex hinge/pivot joint
- Ranges of Motion:
 - Flexion/Extension
 - Hinge between Ulna-humerus/radius-humerus
 - Pronation/Supination
 - Pivot between radius and ulna
- Anatomic landmarks
 - Olecranon process and bursa
 - Medial epicondyle/Lateral epicondyle
 - Radial head



Muscles of the anterior forearm, superficial dissection



Muscles of the posterior forearm: Superficial dissection



Reproduced with permission from: Tank PW, Gest TR. Upper limb. In: Atlas of Anatomy, Lippincott Williams & Wilkins, Philadelphia 2008. Copyright © 2008 Lippincott Williams & Wilkins. www.lww.com

UpToDate®

Common causes of Elbow Pain

Lateral Elbow Pain

- Most common elbow complaint
- Lateral epicondyle and origin of extensor tendons
 - Well localized pain aggravated by activity of wrist extensors
 - Associated with overuse/repetitious use of wrist extensors
- Radiohumeral joint
 - Slightly posterior to epicondyle, not well-localized
 - Affects joint ROM
 - Extension limited by joint effusion
- Referred pain from neck
 - Pain is not aggravated by movement or palpation of the elbow

Medial Elbow Pain

- Medial epicondyle and origin of wrist flexors and pronators
 - Associated with repetitious use of wrist flexors
- Ulnar nerve pain
 - Radiating into the ulnar side of the hand
 - Sensory symptoms in 4th and 5th fingers

Elbow Swelling

- Posteriorly over olecranon process
- +/- warmth and redness
- Usually no affect on joint ROM

slido



**Common daily activities requiring wrist
extensors?**

ⓘ Start presenting to display the poll results on this slide.

slido



Common daily activities requiring wrist flexors?

ⓘ Start presenting to display the poll results on this slide.

Elbow Tendinopathy

- Overuse injury of either wrist/extrinsic hand extensors or flexors
 - Repetitive movement > 2 hours daily
 - Heavy physical loads increase risks
- Risks: Age; smoking and obesity
- Lateral > Medial
- Chronic tendinosis vs acute inflammatory process
 - Rapid forceful eccentric motion of muscle/tendon unit while under a load increases susceptibility on injury
 - Once tendon damage occurs, continued motion increases risk of further damage
 - Poor mechanics are root cause – in sport or occupation

Elbow Tendinopathy

- Onset: Weeks to months
 - Chronicity of symptoms *can* predict severity of condition
- Severity:
 - Mild: annoying more than bothersome
 - Severe: interferes with sleep/basic tasks
- Aggravating factors:
 - Repetitive motions of the wrist and elbow

Lateral Elbow Tendinopathy - “Tennis Elbow”

- Localized tenderness at lateral epicondyle
- Pain with resisted wrist extension with elbow fully extended
- Pain with passive terminal wrist flexion with elbow in full extension
- Other tests: “Book test”

Examination of wrist extension



Pain with resisted wrist extension with the elbow in full extension is characteristic of lateral epicondylitis.

Courtesy of Neeru Jayanthi, MD.

UpToDate®

Palpation of the lateral epicondyle



The lateral epicondyle is palpated for tenderness and swelling with the elbow flexed at 90 degrees. Local tenderness is a hallmark feature of lateral epicondylitis (tennis elbow).

Courtesy of Bruce C Anderson, MD.

UpToDate®

Passive wrist flexion



Pain with passive terminal wrist flexion with the elbow in full extension occurs with lateral epicondylitis.

Courtesy of Neeru Jayanthi, MD.

UpToDate®

Medial Elbow Tendinopathy - “Golfer’s Elbow”

- Localized tenderness at medial epicondyle and proximal wrist flexor muscle belly
- Pain with resisted wrist flexion with elbow fully extended
- Pain with passive terminal wrist extension with elbow in full extension
- Other tests: Resisted wrist pronation

Palpation of the elbow medial epicondyle



The medial epicondyle is palpated for tenderness with the elbow flexed at 90 degrees. Local tenderness is a hallmark feature of medial epicondylitis.

Courtesy of Bruce C Anderson, MD.

UpToDate®

Passive extension of the wrist



Pain with passive terminal wrist extension with the elbow in full extension is consistent with medial epicondylitis.

Courtesy of Neeru Jayanthi, MD.

UpToDate®

Examination of wrist flexion



Pain with resisted wrist flexion with the elbow in full extension is characteristic of medial epicondylitis.

Courtesy of Neeru Jayanthi, MD.

UpToDate®

Olecranon Bursitis

Acute

- Causes
 - Direct injury or trauma
 - Gout
 - Infection
- Findings:
 - Direct tenderness over the bursa
 - Active motion of elbow causes pain over the bursa due to compression
 - Full active/passive flexion uncomfortable
 - Look for redness/cellulitis, possible entry point for infection

Chronic

- Causes
 - Prolonged pressure
 - Overuse/strenuous activity
 - Inflammatory conditions
- Findings
 - Swelling out of proportion to discomfort/tenderness



Olecranon Bursitis

Imaging and aspiration

- Imaging not usually necessary for olecranon bursitis
- Aspiration
 - Diagnostic for suspected gout or infection
 - Therapeutic – relieves pressure
 - AVOID CORTICOSTEROID INJECTION

Treatment

- Relieve symptoms
 - NSAIDS unless contraindicated – topical or oral
 - Ice
 - If present, treat gout
- Joint protection
 - Education
 - Orthosis/compression sleeve
- Septic bursitis
 - Aspiration necessary
 - Empiric treatment with coverage for MRSA

Biomechanics of the Wrist and Hand

- Complex system of bones and ligaments laid out in longitudinal and transverse arches
 - Two transverse: carpal bones and metacarpal heads
 - Longitudinal: 5 rays of the digits
 - Arches withstand and distribute external forces
- Extensor and flexor tendons secured at the wrist by a retinaculum
- Dominant wrist position for daily activities is extension with radial deviation
- Dominant pattern of wrist movement is from extension with radial deviation to flexion with ulnar deviation – “dart-throwing” motion

Evaluation of the Wrist and Hand

- Inspect for deformity, muscle atrophy, swelling, redness
- Palpation:
 - All bony prominences in the distal forearm/wrist
 - Individual digits and joints in the fingers
 - MCP joints
- Ranges of motion:
 - Flexion/extension
 - Radial and ulnar deviation
 - Circumduction
 - Combines all the motions
 - Pronation/supination (forearm)
- Muscle strength testing
- Sensorimotor testing
 - Median nerve
 - Radial nerve
 - Ulnar nerve

slido



What daily activities alter wrist mechanics?

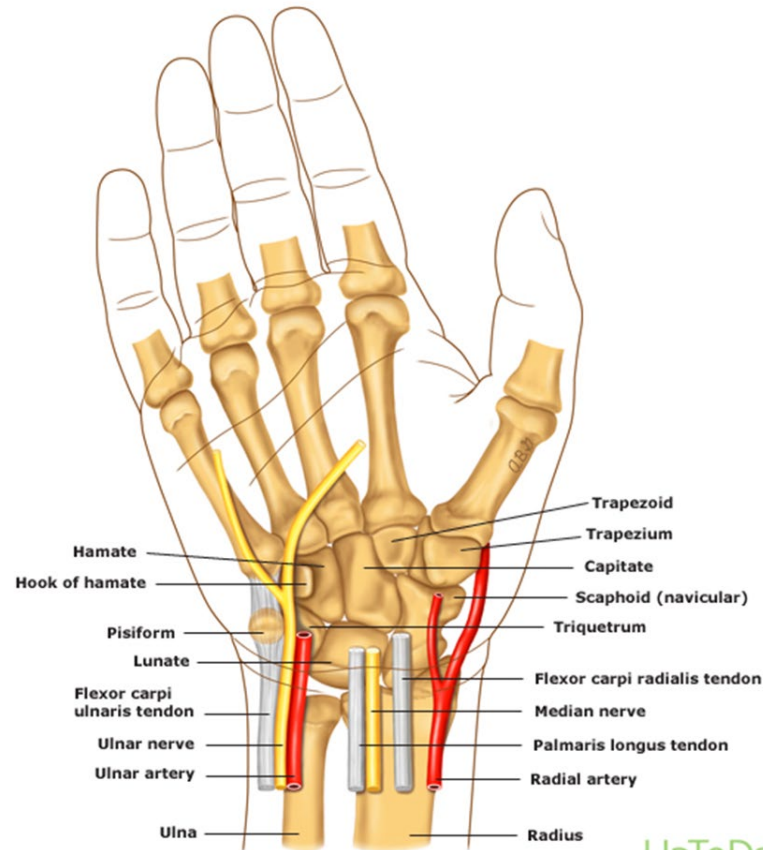
ⓘ Start presenting to display the poll results on this slide.

Evaluation of Wrist Pain

- Timing
 - Acute vs subacute vs chronic
- ?dominant hand?
- Location on the wrist?
 - Ligamentous = localized
 - Nerve compression = diffuse
- Motion that aggravates/alleviates?
- Trauma (acute)
 - Mechanism?
 - Contact sport?
- Quality?
 - Nerve injury = burning, sharp
 - Fracture = deep, constant
 - Ligamentous = waxing/waning
- Occupation
- Recreation
- Sport
- Change in routine?

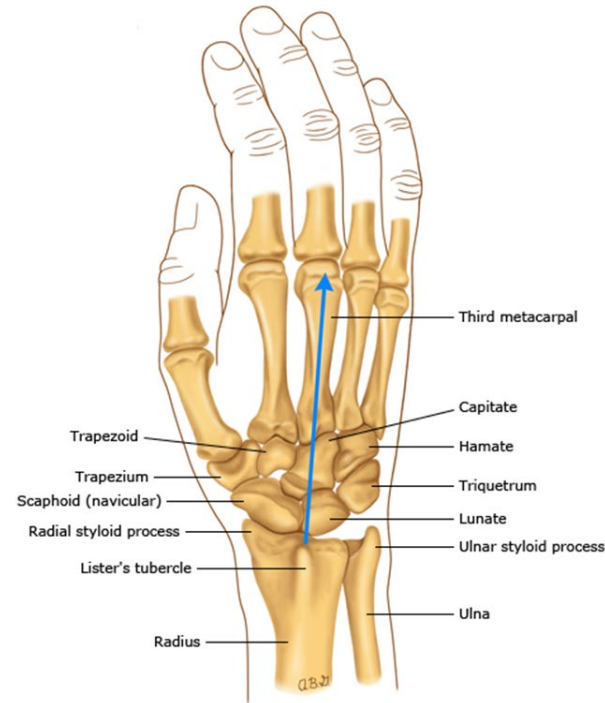
Evaluation of the Wrist and Hand

Anatomy of the volar aspect of the wrist



UpToDate®

Bones of the wrist (dorsal aspect)



One useful landmark for dorsal palpation is Lister's tubercle which lies in approximately the middle of the distal radius, aligned with the middle metacarpal (arrow). Between these bony landmarks lie the lunate and capitate.

UpToDate®

Common wrist injuries and associated sports

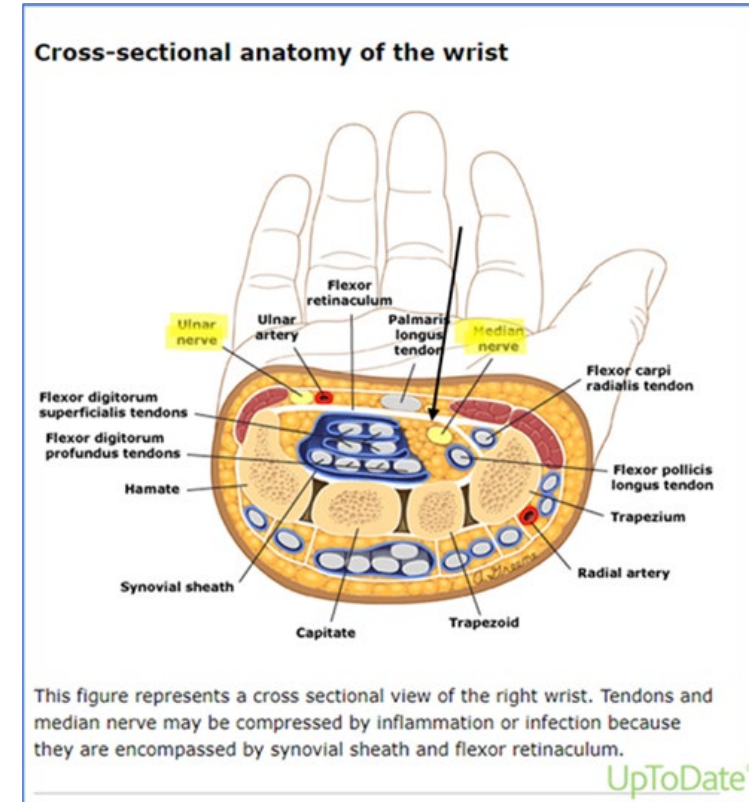
Wrist injury	Sport
Distal radius fracture	Skating, American football, basketball, snowboarding
Hook of the hamate fracture	Baseball, golf, tennis
Intersection syndrome	Rowing and racket sports
Ulnar neuropathy	Cycling
TFCC tear	Tennis
Scaphoid stress fracture	Golf and gymnastics
Ulnar styloid impaction	Gymnastics
ECU subluxation	Tennis

ECU: extensor carpi ulnaris; TFCC: triangular fibrocartilage complex.

UpToDate®

Evaluation of Wrist Pain

- Acute on chronic pain
 - Excessive activity exacerbating an underlying condition
 - CMC arthritis
 - Wrist tendinopathy
- Acute pain not associated with trauma or overuse
 - Look for constitutional symptoms; effusion
 - Monoarticular? Bilateral?
 - Suspect systemic rheumatologic syndrome



CMC arthritis

Carpometacarpal (CMC) osteoarthritis



The normal width of the articular cartilage should be 2 mm. In this case, the articular cartilage has worn away. The trapezium has also lost its normal saddle shape, and the metacarpal bone has subluxed 2 to 3 mm. These findings are consistent with advanced CMC osteoarthritis.

Courtesy of Bruce C Anderson, MD.

UpToDate®

- Presentation is frequently acute on chronic
 - Unrelated to trauma, but exacerbated by overuse
- Pain at the base of the thumb
- Diffuse; aggravated by pinching type activities
- Subluxation is common, patient may report “slipping” sensation when gripping small items
 - Can lead to swan neck deformity
- Loss of pincer strength on strength testing
- Enlargement of metacarpal base

CMC arthritis treatment

- NSAIDS
 - Topical
 - Oral
- Bracing
 - Stabilizes the joint
 - Decreases pain
- Lifestyle adaptation and adaptive equipment
 - Larger grips on pens, even toothbrushes
 - Adaptive kitchen tools
 - Headset instead of holding phone
 - Stand for devices, etc



de Quervain Tendinopathy

- Entrapment tendonitis/tenosynovitis of abductor pollicis longus and extensor pollicis brevis at the radial styloid
- Non-inflammatory thickening of the tendons and the fibro-osseous tunnel they traverse
- Attributed to overuse/repetitive movements of the thumb
- Common in women 30-50 and postpartum

de Quervain tenosynovitis location

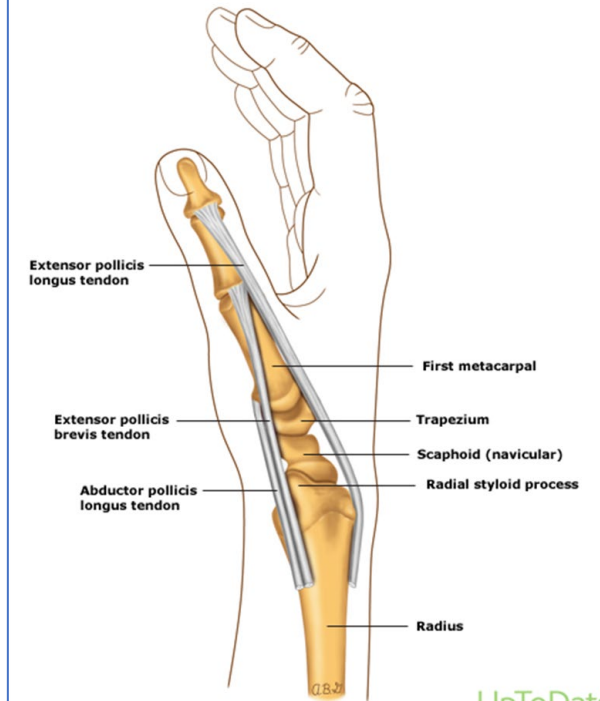


De Quervain's tenosynovitis refers to entrapment tendonitis or tenosynovitis of the abductor pollicis longus and extensor pollicis brevis tendons at the styloid process of the radius.

Courtesy of Blake Boggess, DO.

UpToDate®

Anatomy of the radial aspect of the wrist



Diagnosing de Quervain Tendinopathy

- Pain on radial side of wrist, noticeable with thumb and wrist movement
- May radiate to thumb or forearm
- Tenderness and enlargement of the first dorsal compartment
- Pain with passive stretch of the tendons over the radial styloid (Finkelstein test)
- Radiographs are normal; thickening of tendons on USG

Palpation of the radial styloid



The wrist is placed in a neutral position with the radial side up. The most distal portion of the radial styloid is identified, marked, and palpated for local tenderness.

Courtesy of Bruce C Anderson, MD.

UpToDate®

Test for de Quervain tendinopathy



The maneuver shown above is used to assess for de Quervain tendinopathy. To perform the test, the examiner gently rotates the patient's wrist ulnarly (arrow) while the patient's fingers are folded over the thumb. While often referred to as the Finkelstein Test, this maneuver is actually a variant called the Eichhoff Test.

From Sheon, RP, Moskowitz, RW, Goldberg, VM, Soft Tissue Rheumatic Pain: Recognition, Management, Prevention. 3rd ed, Williams & Wilkins, Baltimore 1996.

UpToDate®

de Quervain Tendinopathy

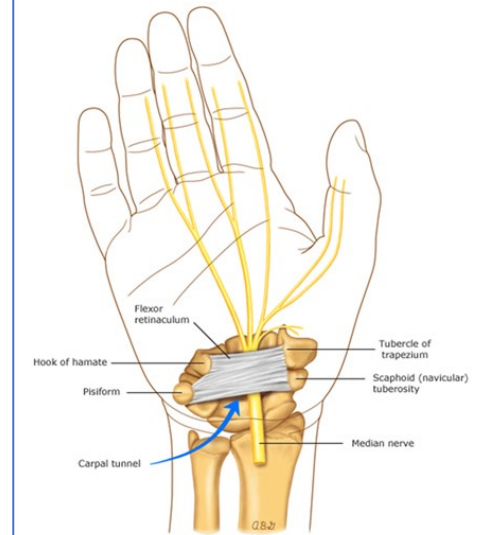
- Usually self-limited
- Forearm based thumb spica splint for comfort
- NSAIDS
- Ice
- Glucocorticoid injection if severe or recalcitrant
- Surgical release of first dorsal compartment is a last resort



Carpal Tunnel Syndrome (CTS)

- Compression neuropathy of median nerve in carpal tunnel
- Typically a chronic syndrome with waxing/waning severity linked to activity
- Pain and paresthesias and occasionally weakness
- Pain is associated with hand positioning/sleep and repetitive motions
- Risk factors:
 - Genetics
 - Activities/habits
 - Systemic disease: thyroid, diabetes, obesity, RA, other CTD

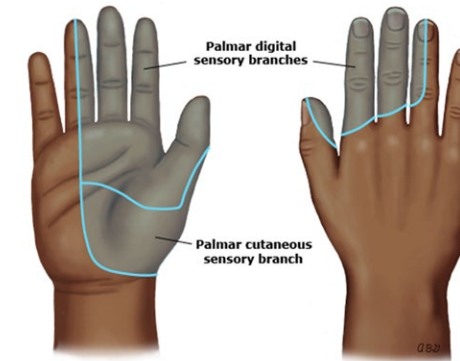
Structures involved with carpal tunnel syndrome



This is a depiction of the volar surface of the right hand showing the relationship of the median nerve to the transverse carpal ligament (flexor retinaculum). The ligament attaches to the carpal bones, including the hamate, pisiform, trapezium, and scaphoid tuberosity (navicular).

UpToDate®

Sensory territory of the median nerve

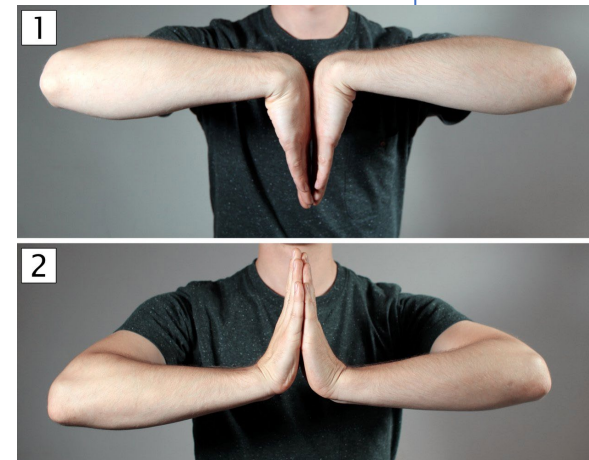
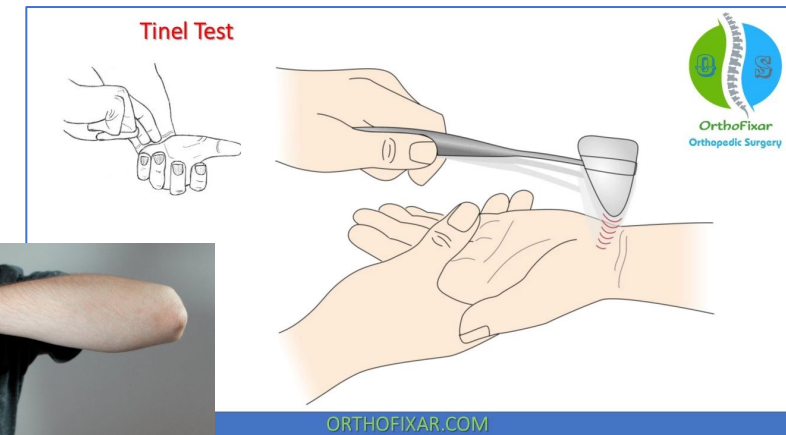


Modified from: Preston DC, Shapiro BE. Median neuropathy. In: Electromyography and neuromuscular disorders: Clinical-electrophysiologic correlations. Butterworth-Heinemann, Boston 1998.

UpToDate®

CTS Diagnosis

- Inspection
 - Atrophy of thenar eminence
- Palpation and ROM typically WNL unless additional problem
- Sensory and motor testing of the upper extremities
- Special tests
 - Hand elevation test (most specific)
 - Hold hands above head up to 2 min
 - Carpal compression test
 - Compression of carpal bones reproduces symptoms
 - Phalen/reverse Phalen test
 - Reproduces symptoms
 - Tinel Test
 - Provokes symptoms by stimulating nerve



Carpal Tunnel Syndrome – Conservative treatment

- Splinting
 - Nocturnal neutral wrist splint trial – 1-2 months; continue as tolerated or with symptom relief
- Glucocorticoid injection
- Physical therapy
 - Carpal bone mobilization and nerve glide exercises
 - https://orthoinfo.aaos.org/globalassets/pdfs/a00789/therapeutic-exercise-program-for-carpal-tunnel_final.pdf
- Occupational therapy
 - Lifestyle/activity modification
- Therapeutic ultrasound



OMT for the Wrist and Forearm

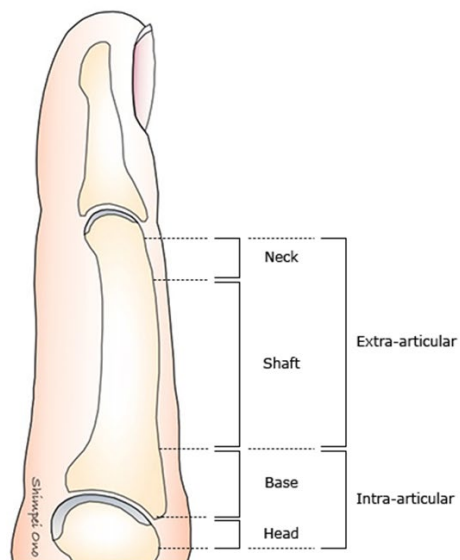
- Myofascial release for flexor retinaculum
- Muscle energy for radial head
- Myofascial release and muscle energy techniques for interosseus membrane/pronator restriction
- Carpal articulatory technique (Figure-8 technique)

Phalanx and Metacarpal Fractures

- About 10% of all fractures
- Distal phalanx most commonly fractured bone in the hand
- Metacarpal – adult
- Phalanx – child
- History
 - Detailed mechanism of injury
 - Dominant hand?
 - Time since injury
 - Occupation/sport
- Inspection
 - Obvious deformity
 - Look for rotational displacement – do the nails line up
 - Open wounds
 - Swelling/crepitus
 - Neurovascular status
 - Localized tenderness
- Radiographs
 - AP, lateral, oblique – digit and hand if needed

Describing Phalanx Fractures

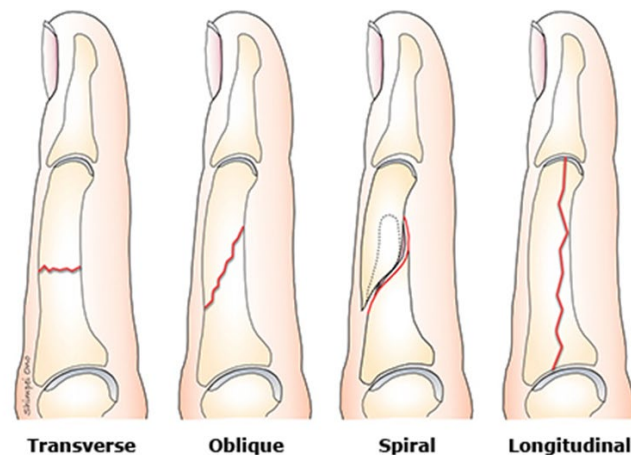
Anatomy of hand fractures - Phalanges and metacarpals



A precise anatomical description of the exact location of a fracture aids in localizing the fracture. The anatomical sites for phalanges and metacarpals include head, neck, shaft, and base. Tuft fractures refer specifically to fractures involving the head of the distal phalanx and intra-articular fractures refer to fractures involving the joint.

UpToDate®

Fracture geometry



Fracture geometry refers to the orientation of the fracture to the long axis of the bone.

Fractures are classified as:

- Transverse - perpendicular to long axis of bone
- Oblique - tangential to long axis of bone
- Spiral - tangential and spiraling around the shaft
- Longitudinal - parallel to long axis of bone
- A combination of two or more of the above

UpToDate®

Description of middle phalanx fracture



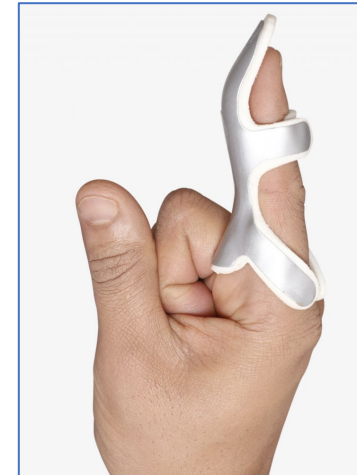
The plain radiograph above shows a fracture of the middle phalanx of the right ring finger. The fracture is located at the junction of the middle and distal third of the shaft (arrows). The fracture has a long oblique orientation. It is deviated radially without any translation in the mediolateral plane. It is shortened by 1 mm with a 30-degree apex palmar angulation. There is minimal comminution at the fracture site, and the fracture is extra-articular.

Courtesy of Sandeep J Sebastin Muttath, MMed, FAMS.

UpToDate®

Treatment of Phalanx Fractures

- Splinting
 - “Safe” position for the hand, if entire hand immobilized
 - Ideally no more than 3 weeks for whole hand to prevent contracture
 - Joints proximal and distal to fracture immobilized; also adjacent digit
 - PIP joint immobilized in FLEXION
 - Tuft fractures – splint DIP only
 - Mallet finger – splint in extension and refer
- Pain control
- Referral to hand surgeon?
 - ALL POSSIBLY OPEN FRACTURES
 - Broad spectrum ABX and referral
 - Involves > 30% of articular surface
 - Stable fractures
 - Non-displaced or easily reduced
 - 7-10 days
 - Unstable fractures
 - Displaced, oblique, spiral
 - 2-3 days



Hand splint



Splint immobilization of an infected hand protects the affected area, limits opening of tissue planes restricting the spread of infection, and decreases pain. Splinting in a position of function can help protect against flexion contractures, reduce stiffness, and hasten rehabilitation. This illustrates a volar splint used to maintain the hand in a functional position.

UpToDate®

References

- [Systematic Musculoskeletal Examinations; Lawry, G. Chapter 2. The Screening Musculoskeletal Examination](#) (via AccessMedicine through the DCOM library)
- https://www.uptodate.com/contents/rotator-cuff-tendinopathy?search=rotator%20cuff%20tendonitis&topicRef=13814&source=see_link
- <https://www.aafp.org/pubs/afp/issues/2016/1201/p925.html>
- https://www.uptodate.com/contents/subacromial-shoulder-impingement-syndrome?search=rotator%20cuff%20tendonitis&topicRef=13814&source=see_link
- https://www.uptodate.com/contents/physical-examination-of-the-shoulder?search=rotator%20cuff%20tendonitis&topicRef=239&source=see_link#H18511193
- <https://www.aafp.org/pubs/afp/issues/2014/0415/p649.html>
- https://www.acofp.org/ACOFPIMIS/Acofporg/PDFs/ACOF17/handouts/thursday/Thurs_pm_330_McKeigue,%20Mark_Habenicht,%20Ann_OMT%20and%20Sports%20Medicine%20for%20the%20Upper%20and%20Lower%20Extremities.pdf
- <https://pubmed.ncbi.nlm.nih.gov/32825990/>
- <https://www.aafp.org/pubs/afp/issues/2014/0415/p649.html>
- https://www.uptodate.com/contents/evaluation-of-elbow-pain-in-adults?search=elbow%20pain%20adult&source=search_result&selectedTitle=1~70&usage_type=default&display_rank=1#H2
- https://www.uptodate.com/contents/bursitis-an-overview-of-clinical-manifestations-diagnosis-and-management?search=olecranon%20bursitis&source=search_result&selectedTitle=1~11&usage_type=default&display_rank=1

References

- [https://www.uptodate.com/contents/evaluation-of-the-adult-with-acute-wrist-pain?search=wrist%20pain&topicRef=84021&source=see link](https://www.uptodate.com/contents/evaluation-of-the-adult-with-acute-wrist-pain?search=wrist%20pain&topicRef=84021&source=see_link)
- [https://www.uptodate.com/contents/de-quervain-tendinopathy?search=wrist%20pain&topicRef=245&source=see link](https://www.uptodate.com/contents/de-quervain-tendinopathy?search=wrist%20pain&topicRef=245&source=see_link)
- [https://www.uptodate.com/contents/carpal-tunnel-syndrome-treatment-and-prognosis?search=wrist%20pain&topicRef=245&source=see link](https://www.uptodate.com/contents/carpal-tunnel-syndrome-treatment-and-prognosis?search=wrist%20pain&topicRef=245&source=see_link)

Addendum- Osteopathic Approach to Upper Extremity Injuries/Conditions

Cervical spine

Thoracic inlet

Ribs

Thoracic Spine

Clavicle

Glenohumeral joint

Elbow

Hand/wrist

Glenohumeral Myofascial Release



- Physician is behind patient with hands around GH and AC joint.
- Patient is completely relaxed and laying on contralateral side
- Traction introduced → flexion → extension → abduction → adduction → scapular motion until balance point is achieved
- End treated with gentle traction and circumduction of shoulder
- Reassess

Scapular/thoracic Release

- Step 1-Patient sidelaying with shoulder internally rotated
- Physician places finger under winging scapula and moves cranial and caudal hands in scapular elevation/depression and protraction/retraction then medial/lateral rotation.
- Options- hold into ease of motion (indirect), hold into barrier of motion (direct) or use continuous motion (soft tissue)
- Step 2- Patient sidelaying with arm abducted, repeat same steps at Step 1



Carpal Tunnel Release



- Physician places thumbs and thenar eminences on each side of the carpal tunnel near hypothenar and thenar eminence of patient
- As physician move the patients wrist into extension, they are spread their finger apart and holding until release.
- Repeat 3-5 times

Anterior Radial Head Muscle Energy



1. Physician monitors motion as radial head and moves into pronation of forearm until movement at radial head is felt
2. Patient tries to supinate against the physician for 3-5 secs then relax
3. Physician moves forearm into more pronation to next barrier and repeat Step 2
4. Repeat 3-5 times total

Posterior Radial Head Muscle Energy



1. Physician monitors motion as radial head and moves into supination of forearm until movement at radial head is felt
2. Patient tries to pronate against the physician for 3-5 secs then relax
3. Physician moves forearm into more supination to next barrier and repeat Step 2
4. Repeat 3-5 times total



Radial/Ulnar Interosseous Release

- Physician palpation anterior and posterior forearm and finds the area of most TART changes (proximal hand)
- Physician induces supination/pronation and shifting radius and ulnar interosseous motion to find the areas of most restriction (distal hand)
- Physician then adds compression or traction with hands until release is felt
- Reasses
- CAUTION with unstable distal radius ulnar joint