Repetitive Motion Conditions of the Upper Extremity

ROGER BLAUVELT, MD

ORTHOPAEDIC HAND AND UPPER EXTREMITY SURGEON

CASCADE ORTHOPAEDICS

AUBURN, WA

ExamWorks

Occupational Diseases of the Upper Extremity

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Upper Extremity

Upper extremity disorders are a huge source of workmen's compensation claims and resources

More prevalent than back injuries

Atraumatic upper extremity disorders predominate

- These are occupational diseases rather than traumatic injuries.

Approach

Two things to discuss

- The Science/Medical
- The Legal/Administrative/Political
- These tend to blend together in discussion

Approach

Terminology

Medical information about conditions

- Anatomy
- Injury patterns
- Specific Diagnoses

How each diagnosis pertains to work related injury

- Causation

Terminology

- Repetitive Motion Condition
- Repetitive Use Disorder
- Repetitive Strain Injury (RSI)
- Cumulative Trauma Disorder (CTD)
- Overuse

These are not medical terms. They do not describe a specific disease or process.

These terms are looked down upon in the hand surgery community.

Physicians should avoid using these terms in their medical documentation.

That being said, they have been incorporated into our medicolegal lexicon by clinicians, patients, administrators and lawyers

Terminology

Bad Terminology

According to the American College of Occupational and Environmental Health in a publication, edited by Lee Glass, M.D. :

“the term repetitive motion disorder, cumulative trauma, overuse syndrome should not be used .”

Terminology

Bad Terminology

Repetitive Stress is a general term used to describe a variety of injuries, that are correlated with a response to repetitive and excessive demands placed on the body. *Disabled World News 06-25-2012*

The evidence that RSI (CTD) exposure in modern work is the cause of most reported upper limb injury is limited and inconsistent.

Terminology

Repetitive Stress Disorders (RSI) …if we must use the term…

- Repetitive Strain is not a specific diagnosis but represents a broad categorization of a group of disorders with a common etiology.

Terminology

Repetitive Stress Disorders (RSI) …if we must use the term…

Two types

- Type 1 – correlates to a specific diagnosis (SO USE THAT DIAGNOSIS)
  - Carpal Tunnel Syndrome, Lateral Epicondylitis, etc…
  - More likely to have objective findings
- Type 2 – Diffuse RSI
  - Nonspecific Pain Syndrome
  - Problematic/Controversial

Terminology

What qualifies as “Repetitive”?

- Examples:
  - Experimental animal studies of overuse often utilize sustained exposure of rates of 75- 100 cycles per minute.
  - Research has suggested that rates of repetition below 10 cycles per minute for sixty minutes for the elbow and wrist and 100 cycles per minute for the fingers pose minimal risk to healthy workers.

Terminology

What qualifies as “Repetitive”?

- Confusion exists in the scientific community and in the minds of the public. What do physicians mean by the term “repetitive strain”?

There is no consensus.

Terminology

Bad Terminology

- The scientific basis for descriptive classification terms implies a uniform etiology. In the case of RSI and CTD this is weak or absent and they are inconsistently applied/understood; and they should be avoided.
- Classification and diagnoses of upper limb disorders are particularly problematic.
- Inconsistent use of diagnostic criteria leads to misdiagnoses, incorrect labeling and difficulties in interpretation of research studies.

Terminology

It is not all about “repetition”

Exposure has components:

- Frequency
- Duration
- Intensity
- Awkward Positioning
- Vibration
- Chronicity

Terminology

Common perception

- Both medical and lay population indulge belief systems that are often without merit
- Urban myth propagates
- “Intuitive” reasoning without evidence
- Lack of “evidence based” decision making

Terminology

Common misperception – example

- “I never had this problem until after XXXXX happened”
- There is a big difference between CORRELATION and CAUSATION (correlation does not imply causation)
- It is quite remarkable how many occupational medicine doctors with MPH degrees make this causation argument

Terminology

Common misperception – example

- Behavioral science shows that individuals tend to make cause and effect associations where they do not exist.
- This is not necessarily nefarious, it just may be human nature

J Bone Joint Surg Am 2020 Oct 8

Misperception of Disease Onset in People with Gradual-Onset Disease of the Upper Extremity

Maartje Lemmers [1], Yvonne Versluijs [1], Joost T P Kortlever [1], Amanda I Gonzalez [1], David Ring [1]

Terminology

Biopsychosocial

- Refers to the concept that biological, psychological, and social factors combine to play a significant role in human functioning; and these need to be considered as an interlinked system

Psychosocial

- Interaction between the person (beliefs, emotions, behavior, etc.) and their social environment

In other words – the claimant's beliefs, mood, state of mind, attitude, personality, etc. play a HUGE factor in how they manifest symptoms.

POP QUIZ

What question provides the greatest value in predicting return to work after industrial injury?

- Injury severity?
- Body part injured?
- Loss of mobility?
- Loss of sensation?
- DO YOU LIKE YOUR JOB?

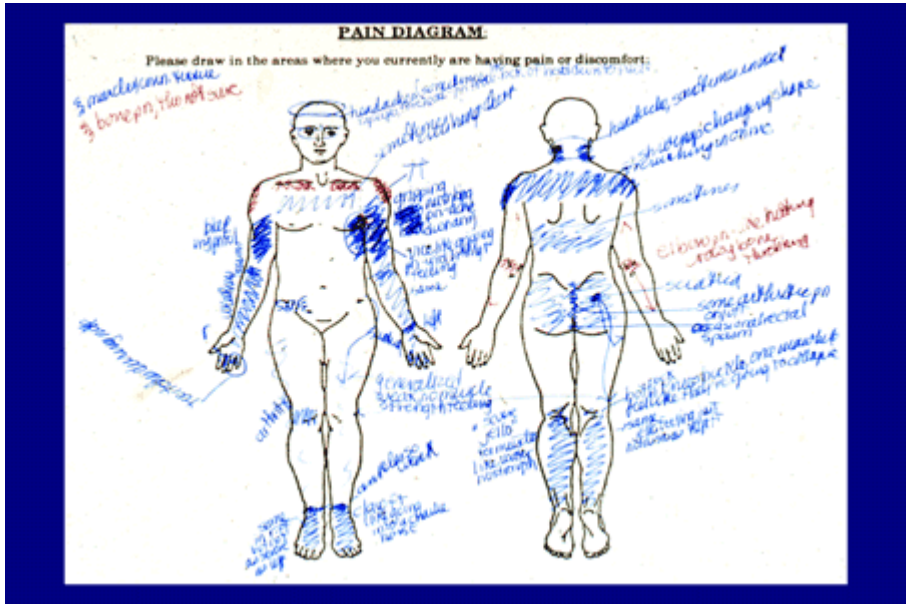
POP QUIZ

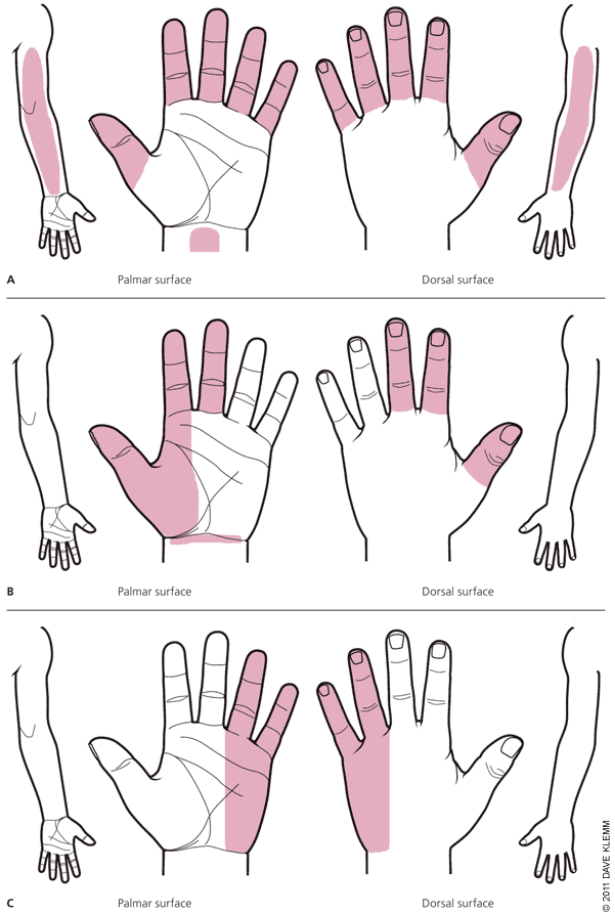
Which claimant has the better prognosis after industrial injury?

- Angry, injury fault of employer's negligence, perceived unfair work environment, depressed, social stresses at home (financial, divorce, illness…)
- Loyal, enjoys work, feels respected by employer

Tools – Pain Diagrams

Priceless indicator of specificity of disease and prognosis of treatment





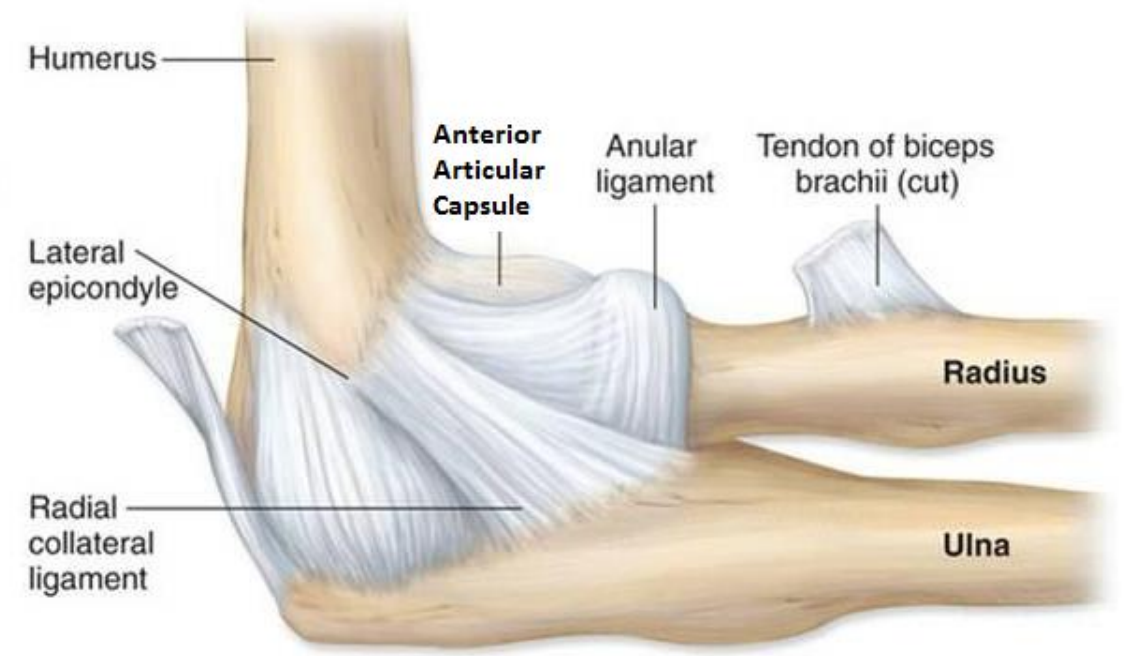
Terminology

Occupational disease vs Injury

- **Injury** – precipitated by acute event
- **Occupational Disease** - An **occupational disease** is a **disease** or disorder that is caused by the work or working conditions. This means that the **disease** must have developed due to exposures in the workplace and that the correlation between the exposures and the **disease** is well known in medical research.

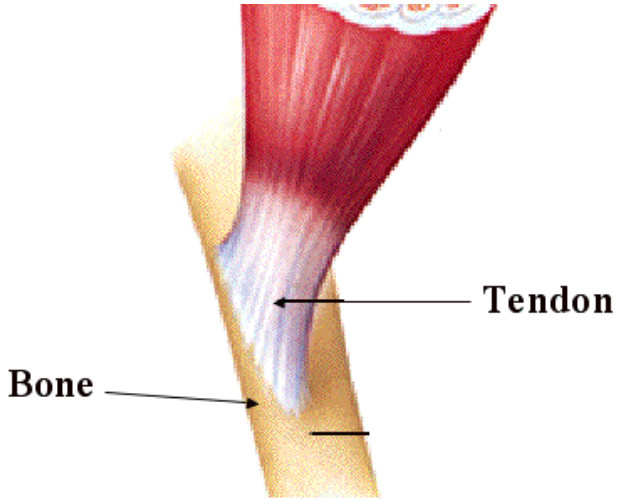
Terminology - anatomy

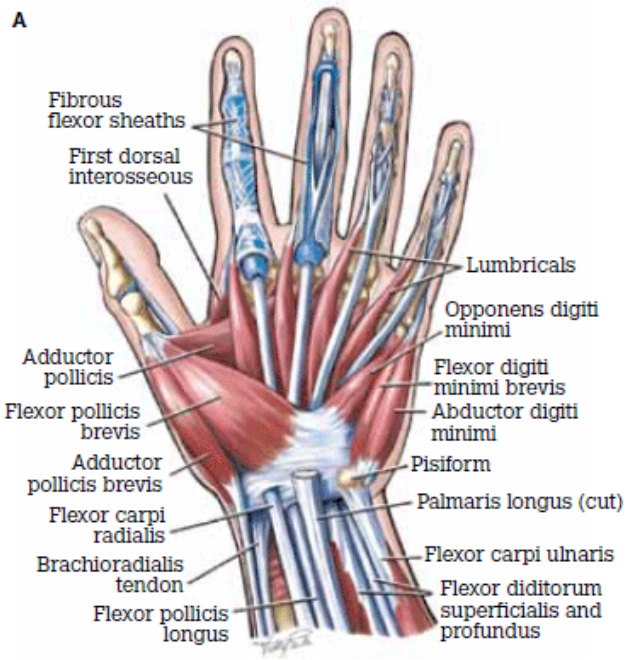
Ligament -a short band of tough, flexible, fibrous connective tissue that connects two bones or cartilages or holds together a joint.

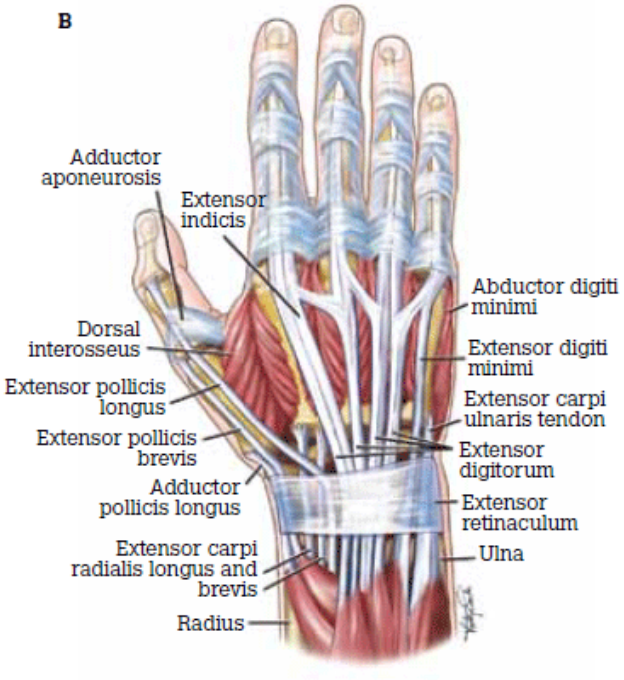


Terminology - anatomy

Tendon - a flexible but inelastic cord of strong fibrous collagen tissue attaching a muscle to a bone.

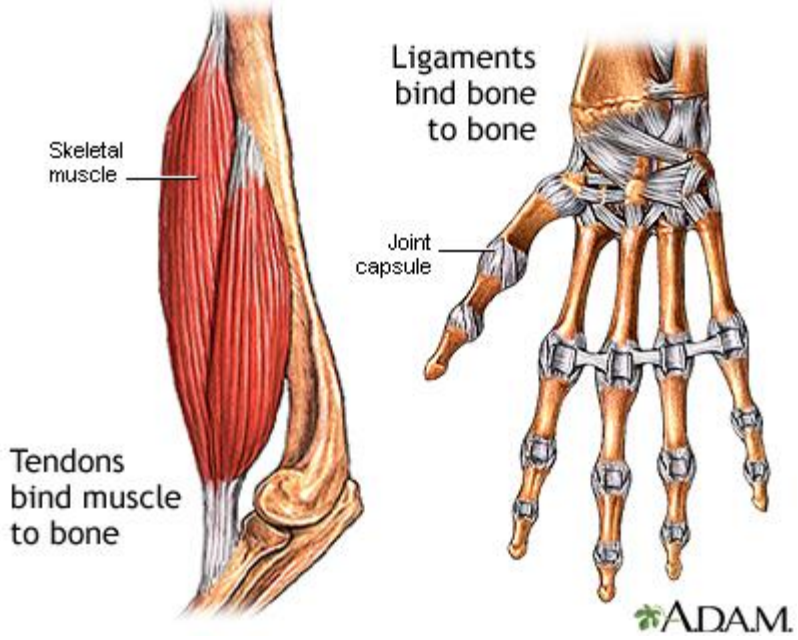






Terminology - anatomy

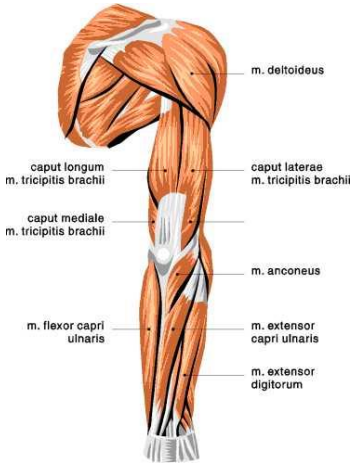
Tendons vs Ligaments



Terminology - anatomy

Muscle -a band or bundle of fibrous tissue in a human or animal body that has the ability to contract, producing movement in or maintaining the position of parts of the body.

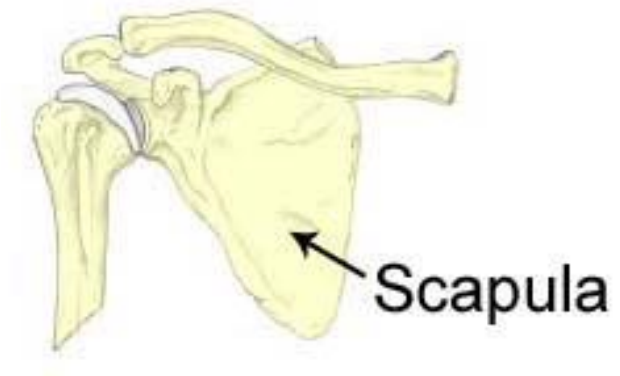


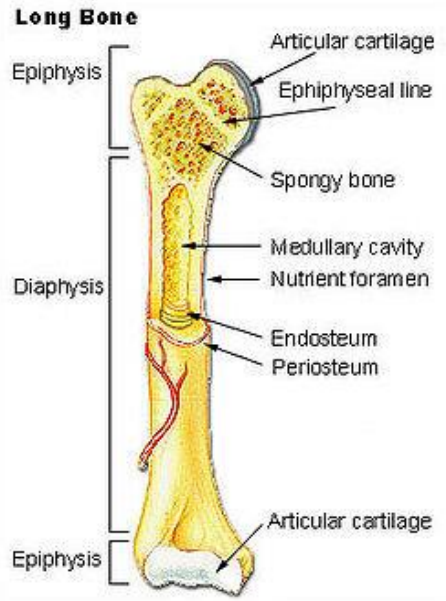


Terminology - anatomy

Bone

- Tubular
  - Femur, Humerus, Phalanges
- Non Tubular
  - Vertebral bodies
  - Pelvis
  - Scapula
  - Carpals – wrist
  - Tarsals - foot

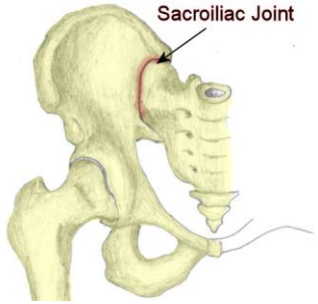


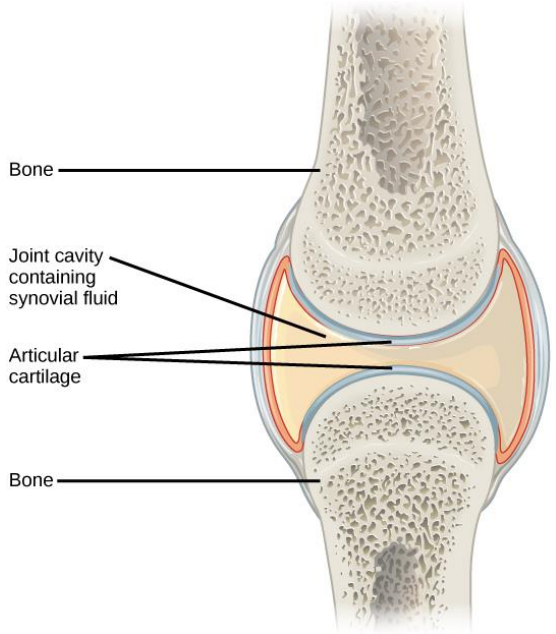


Terminology - anatomy

Joint

- Synovial (diarthrodial)
  - Most typical hinged joints
  - Abutting cartilage with fluid capsule
- Fibrous (synostosis)
  - Little motion
  - Dense fibrous connection between bones
  - Sacroiliac, pubic symphisis, skull bones
  - Intervertebral disk – special case

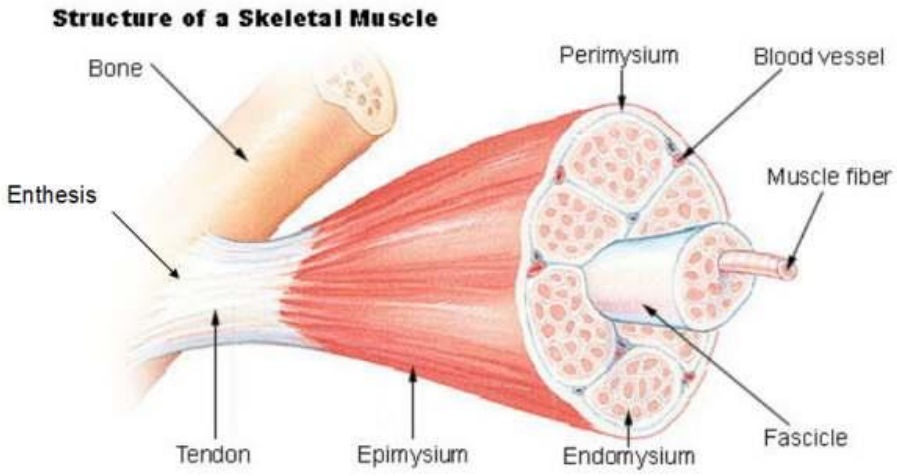


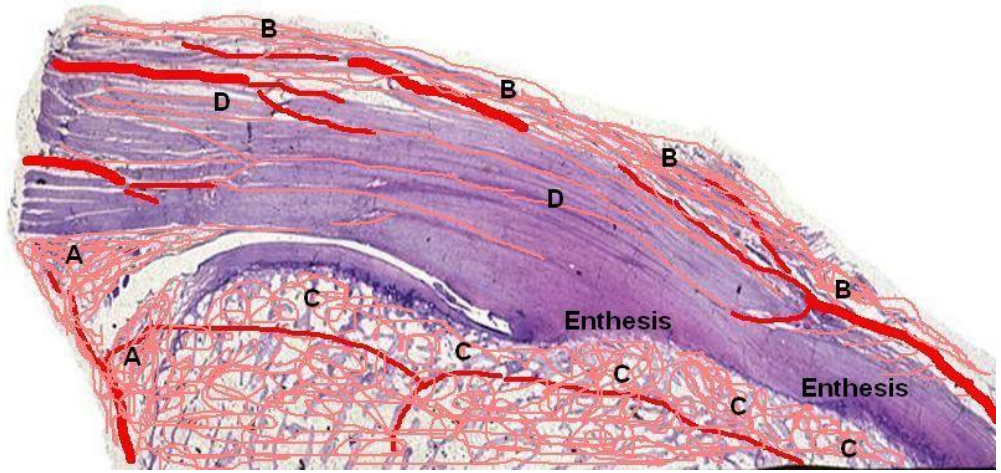


Terminology - anatomy

Enthesis

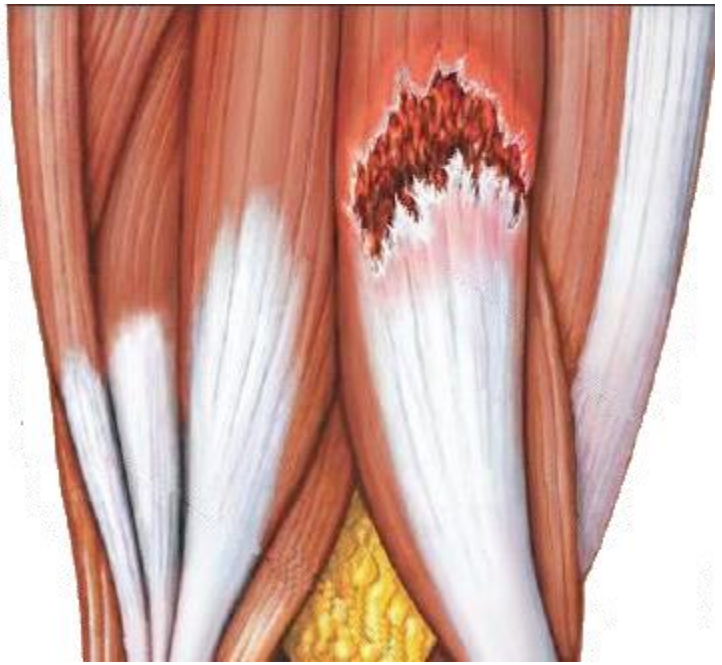
- The attachment point where tendon or ligament attaches to bone





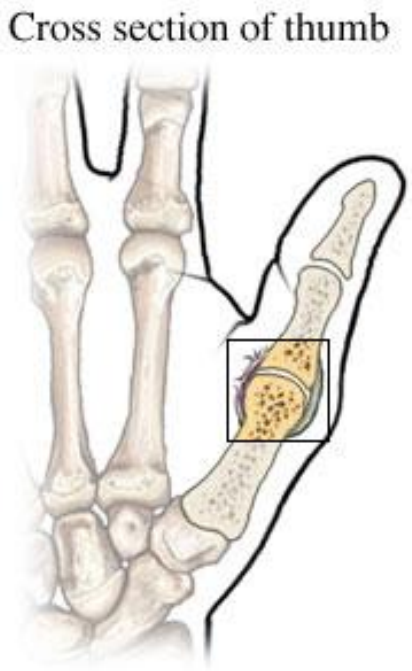
Terminology - injury

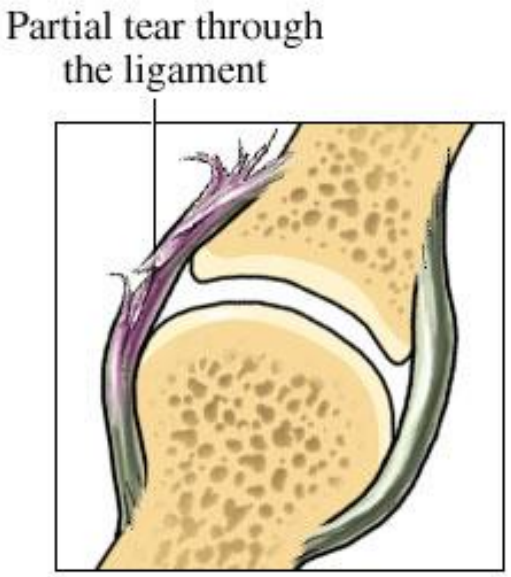
A **strain** is when a muscle is stretched too much and tears. It is also called a pulled muscle. A **strain** is a painful injury. It can be caused by an accident, overusing a muscle, or using a muscle in the wrong way.



Terminology - injury

Sprain - an acute injury to ligamentous tissues that results from overstretching, ranging in severity from tissue microtrauma to total disruption of the tissues.



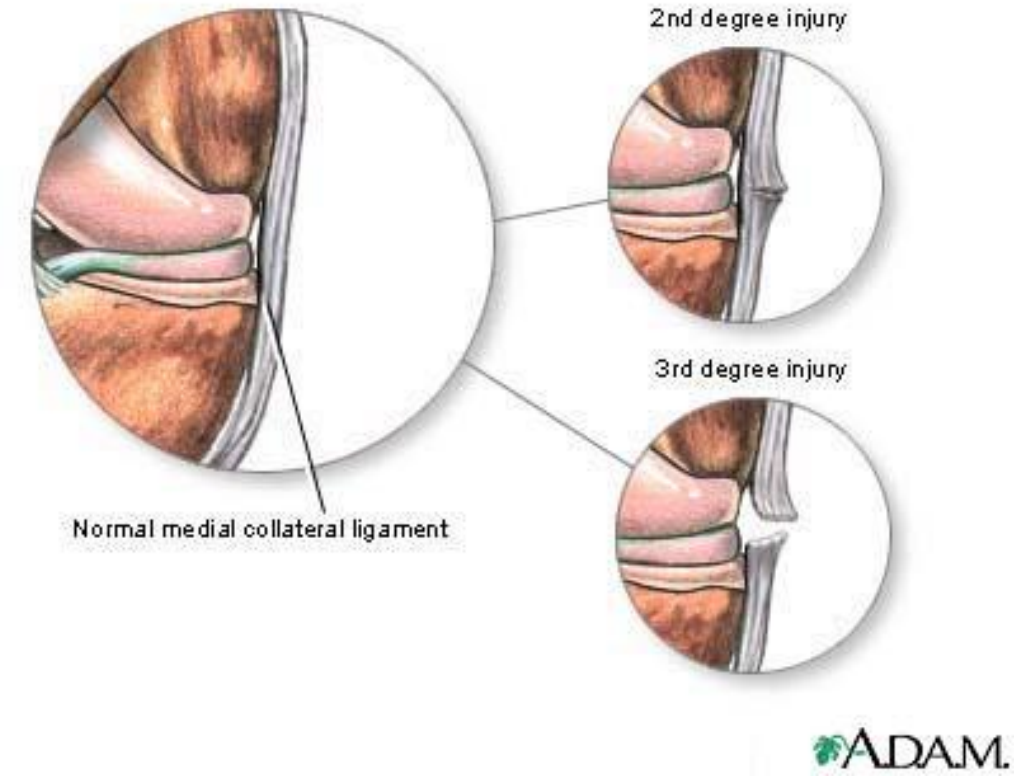


Terminology - injury

Sprains and **Strains** vary in severity

Grade I, II, III

- I – stretch or mild tear
- II – partial tear
- III complete tear



Terminology - injury

The terms **Sprain** and **Strain** are often used interchangeably. This is improper. However, it is widespread and unlikely to change.

Terminology - injury

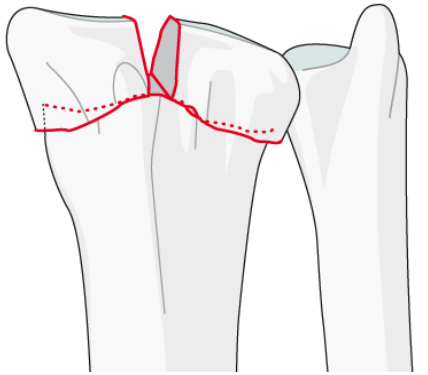
Tendonitis (tenosynovitis)

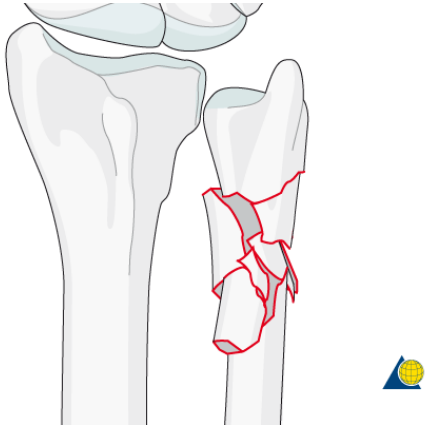
- Inflammation of a tendon
- Can occur due to normal activity or “overuse”
- Can be caused by medical conditions
  - Rheumatoid arthritis (inflammatory arthritis)
  - Infection

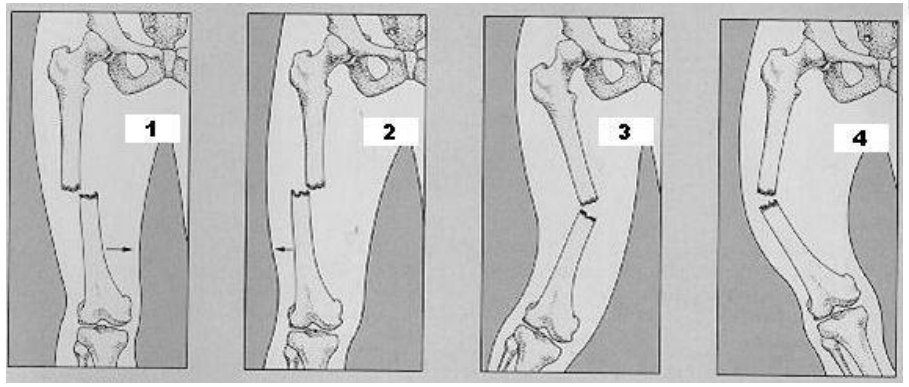
Terminology - injury

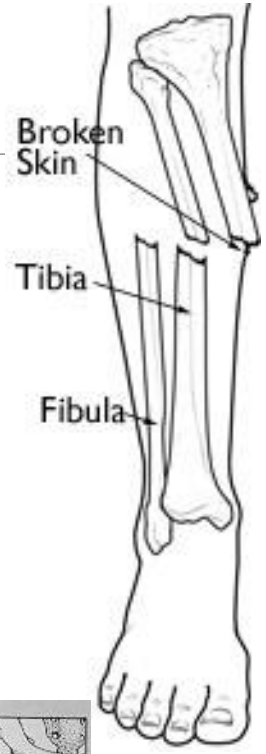
Fracture – Broken bone

- Non-displaced/displaced
- Open/closed
- Angulated
- Comminuted
- Articular







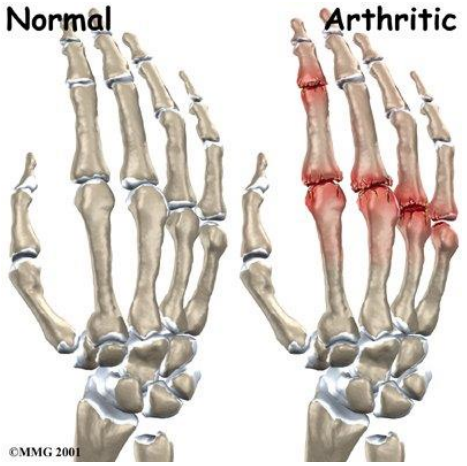


Terminology - injury

Joint injury – joints can be affected by

- Fracture
- Dislocation (very severe sprain)
- Arthritis (joint wear and tear)
  - Usually gradual and with age
  - Can be jump started by joint injury
    - Sprain
    - Fracture

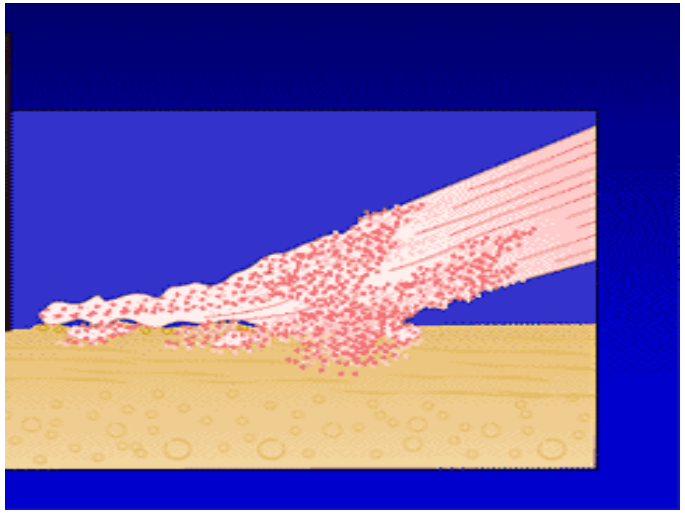




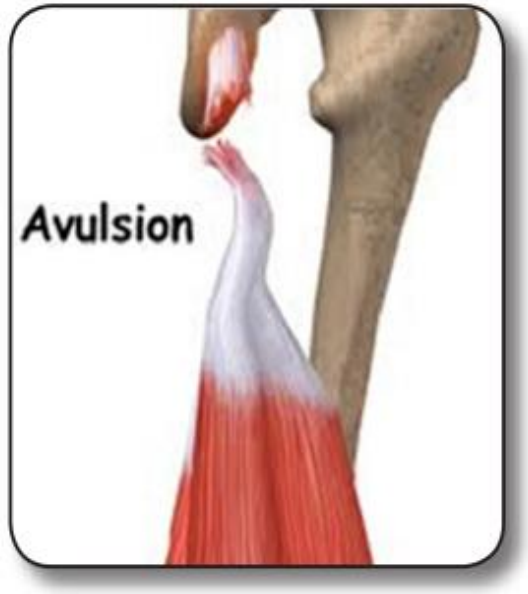
Terminology - injury

Enthesis

- Enthesopathy
  - Connection inflamed or degraded
  - Occupational disease



- Avulsion
  - Connection torn
  - Occupational injury



Occupational Diseases of the Upper Extremity (Potentially!)

Carpal Tunnel Syndrome

Cubital Tunnel Syndrome

Trigger Finger

deQuervain's Tendonitis

Lateral Epicondylitis

Medial Epicondylitis

Arthritis

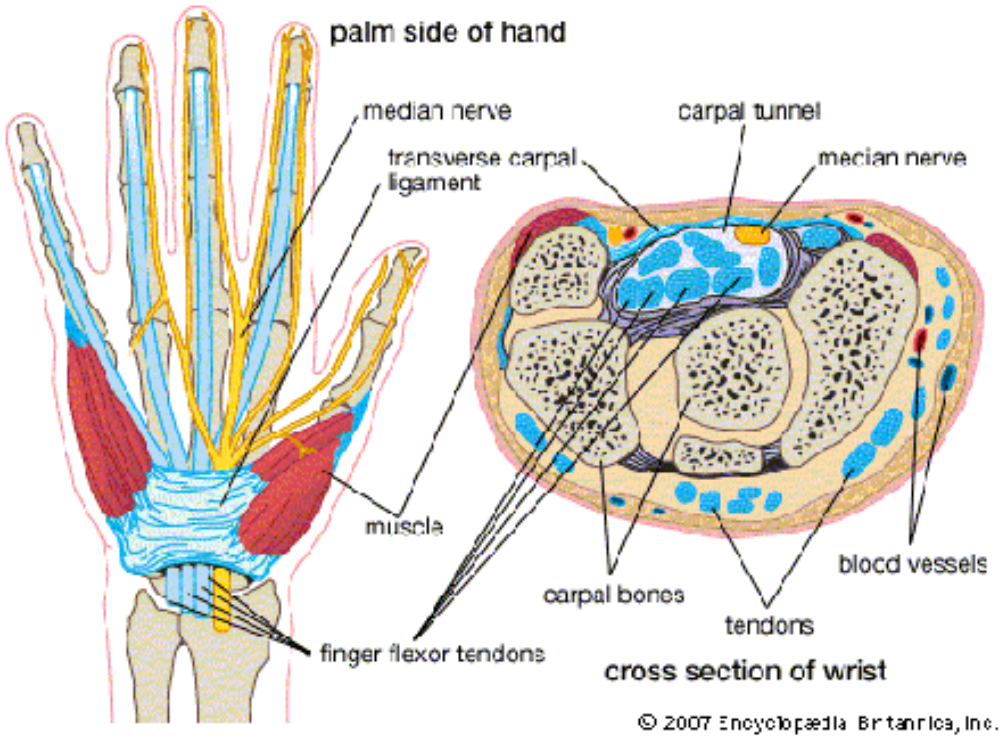
Ganglions (cysts)

Rotator Cuff disorders

Carpal Tunnel Syndrome

Anatomy

- The “carpal tunnel” is an anatomic structure in the normal wrist
  - Floor and walls are bony
  - Roof is ligamentous
  - It provides passage for 9 tendons and one nerve
    - Finger flexor tendons
    - Median nerve



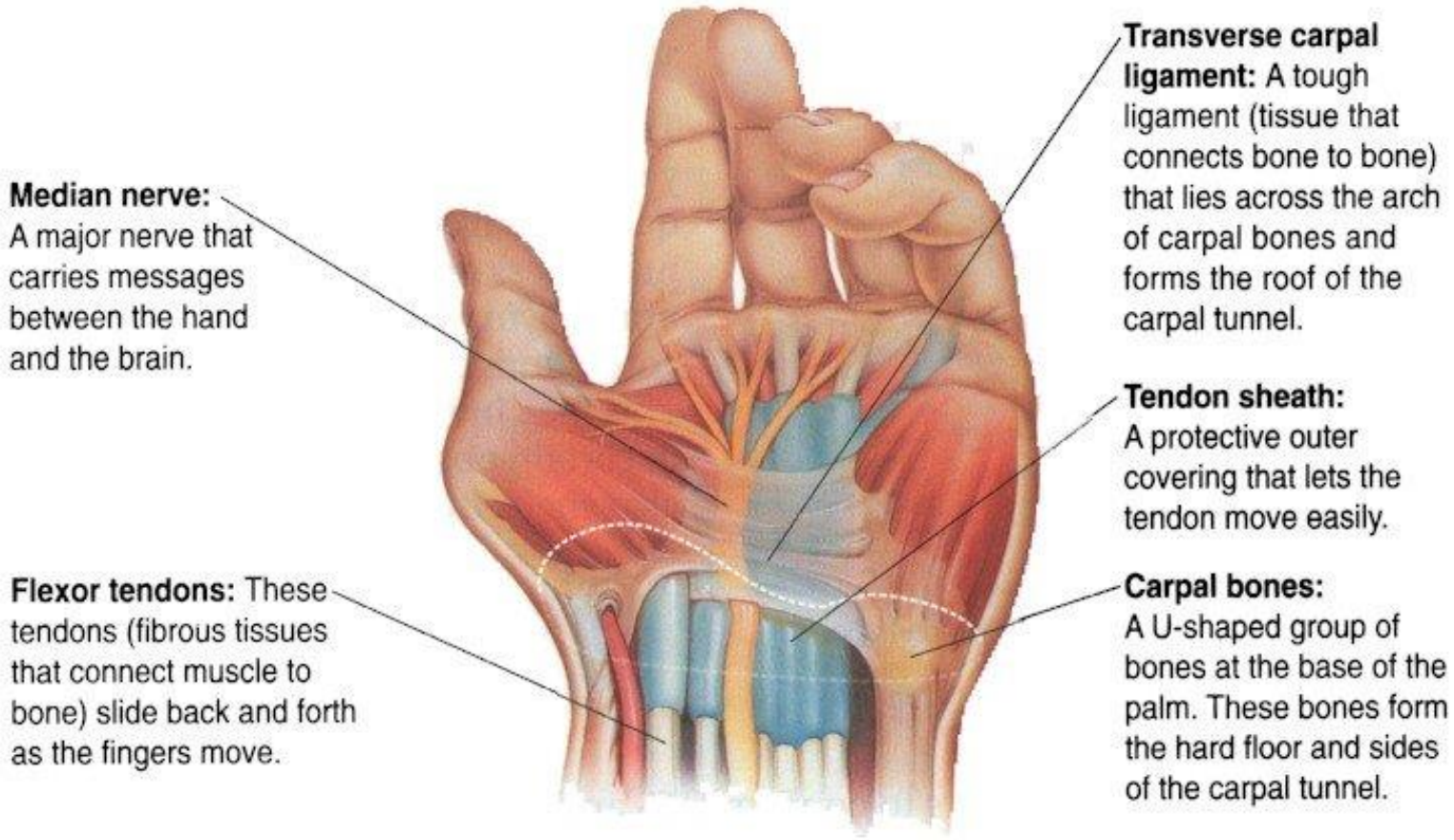
Carpal Tunnel Syndrome

Carpal Tunnel Syndrome (CTS)

- Occurs when the pressure within the tunnel is increased substantially. The median nerve does not tolerate that pressure and becomes dysfunctional
- The pressure is increased due to swelling of the tendons within the tunnel
- Median nerve dysfunction is manifested by pain and numbness

Carpal Tunnel Syndrome

Pathophysiology



Carpal Tunnel Syndrome

Symptoms

- Numbness Numbness Numbness Numbness Numbness Numbness
- Pain (with numbness)
- Burning, tingling, aching
- Drop things
- Numbness is worst when hand is still
  - Awakens from sleep
  - Holding phone
  - Driving
  - Doing hair
  - Holding book

Carpal Tunnel Syndrome

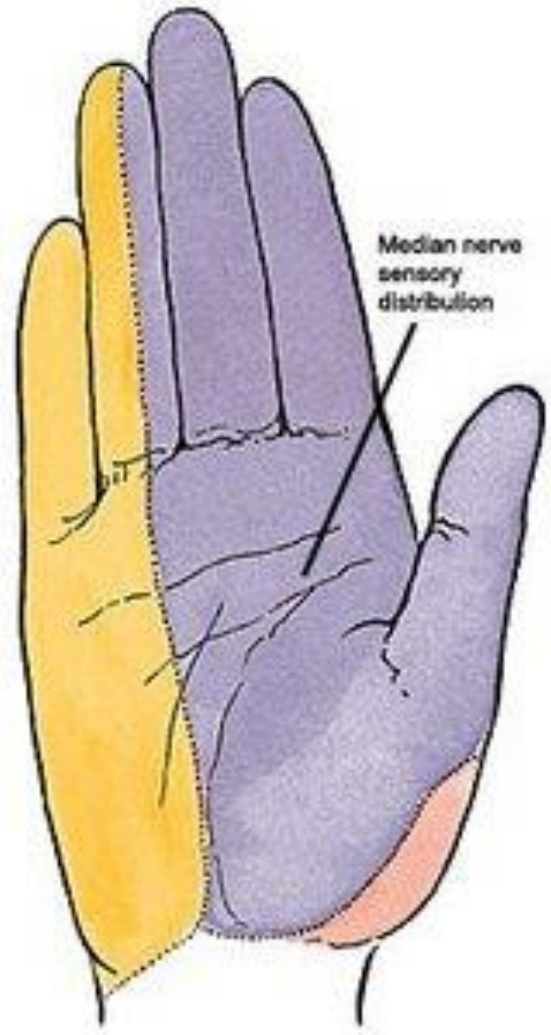
Symptoms

- Generally worsen with time, often over years
- Vary with activity level (busy day, worse night)
- Can be bilateral or one worse than other
- Occasional swelling or swollen sensation
- Clumsiness

Carpal Tunnel Syndrome

Symptoms

- Numbness is in Median Nerve distribution



Carpal Tunnel Syndrome

Epidemiology

- Women > Men (~3:1)
- Usually over 30 years old, peak over 40

Carpal Tunnel Syndrome

Causation

- Idiopathic (no cause) HUGE majority
- Risk factors
  - Pregnancy – CTS during, usually resolves after
  - Diabetes
  - Rheumatoid disease (inflammatory arthritis)
  - Obesity
  - Biopsychosocial
  - Severe trauma (wrist fracture)
  - ***Occupational***

Carpal Tunnel Syndrome

Occupational Risk Factors

- Typical Jobs that can cause aggravation
  - Mason
  - Meat Cutter
  - Riveter
  - Mechanic
  - Wire crimper
  - Moving freight
- NOT
  - Writing

Carpal Tunnel Syndrome

Causation – KEYBOARDING

– what's up with that?



Carpal Tunnel Syndrome

Causation – KEYBOARDING

- The hand surgery community has been skeptical of any link of keyboarding to CTS
- The medical literature is very weak on any link to keyboarding. Most studies show a relative risk of less than 2 which is what seems to be the threshold for validity of causation.
- *The Guides to the Evaluation of Disease and Injury Causation, 2nd Edition*, does not support this causation.
- I have a huge bibliography that supports “no causation” if anyone is interested.

Carpal Tunnel Syndrome

Causation – KEYBOARDING

- There still is an air of controversy
- In 2017 LNI in response to this has come out with a position statement in the form of an edit to the Medical Treatment Guidelines
- Carpal Tunnel Syndrome (CTS) Guideline (**Effective** July 1, 2017)
  - There is insufficient evidence to definitively establish a cumulative exposure to keyboarding or mousing at which CTS will occur. However, given the available evidence of an association, workers whose principal job duties involve prolonged, consistent, and cumulative computer keyboard and/or mouse usage of at least 20 hours per week could be at increased risk of developing work-related CTS. The association of these exposures with CTS is considered lower (relative risk < 2) compared to exposures with greater force, awkward postures, or combinations of repetition, force, and awkward postures (Table 1).

Carpal Tunnel Syndrome

Causation – KEYBOARDING

- With the threshold of 20 hours of keyboarding set by department policy, it is difficult to make an argument against that scientifically.
- If there is a clear situation with a job description with over 20 hours of keyboarding then causation is a done deal.
- Some would call this a cop-out by the department
- Some refuse to write opinions given their disagreement

Carpal Tunnel Syndrome

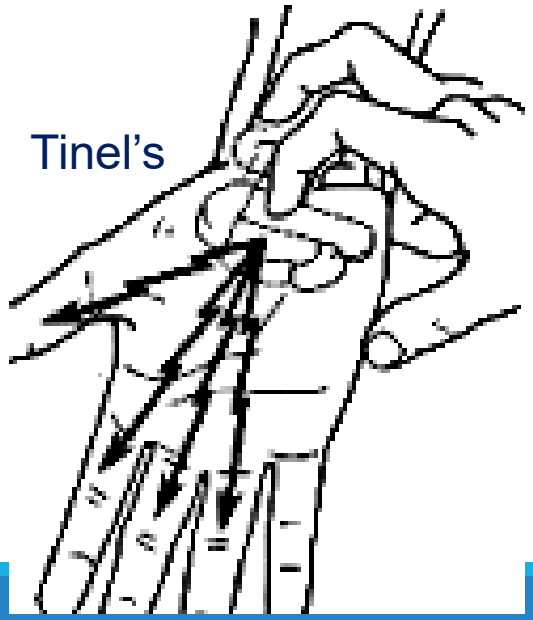
Occupational Risk Factors

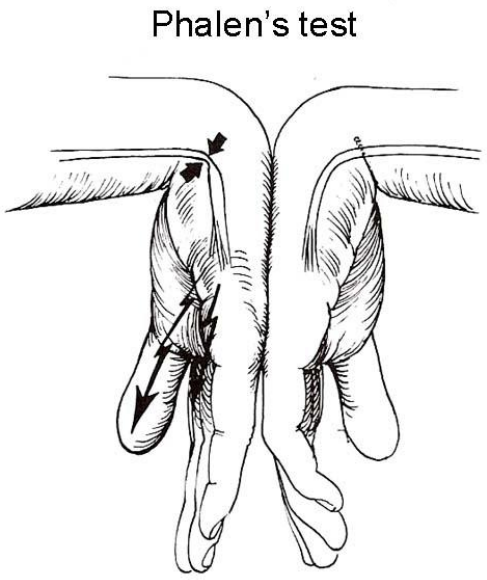
- Trauma (not occupational disease)
  - Violent trauma (wrist fracture) YES
  - Minor trauma – probably not
    - Wrist sprain from fall or MVA
    - Contusion
    - Often a back door in to a CTS claim

Carpal Tunnel Syndrome

Diagnosis

- History History History
- Physical exam (not so much)
  - Sensation loss (later finding)
  - Muscle atrophy (very late finding)
  - Provocational Testing





Carpal Compression Test

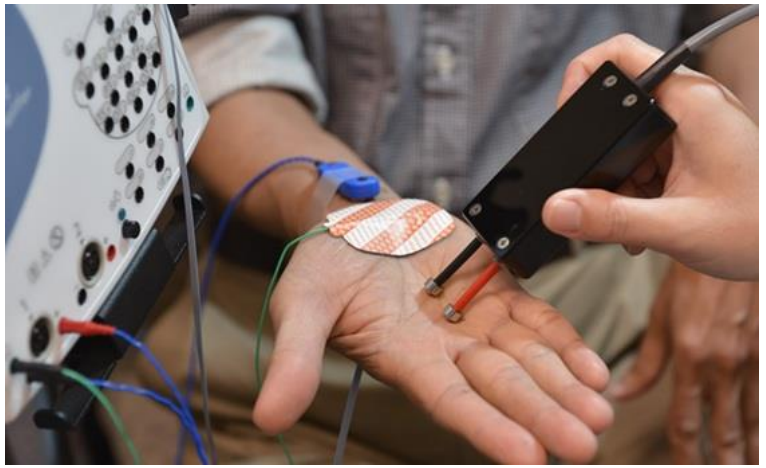


Carpal Tunnel Syndrome

Diagnosis

- Electrodiagnostics
  - Nerve Conduction Test (NCS)
  - Electromyography (EMG)
- The gold standard for measuring the presence and severity of CTS

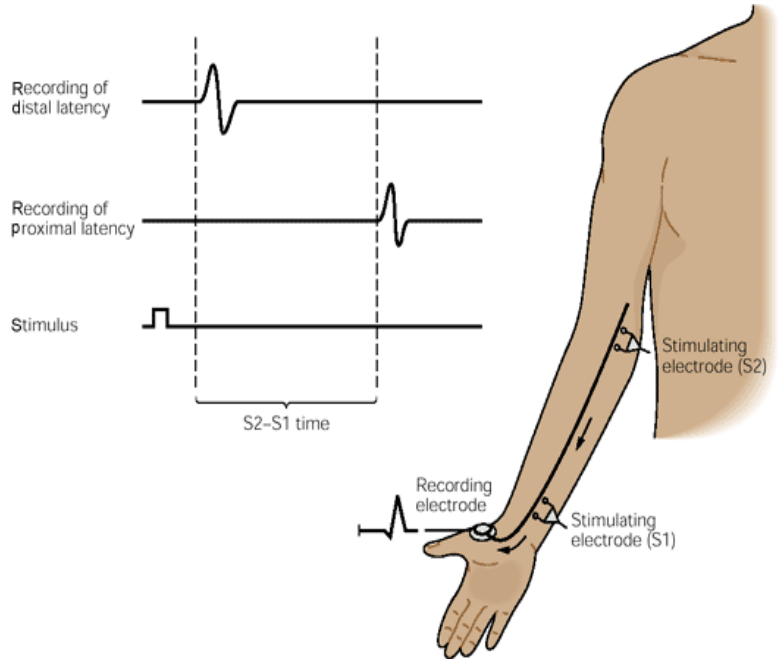




Carpal Tunnel Syndrome

Diagnosis

- Electrodiagnostics
  - Nerve conduction velocity
    - The speed at which an electrical impulse travels along a nerve
    - A slowing in the speed of the transmission of the signal can mean the nerve is “sick” or injured.
    - Compression of the nerve will create a delay or slowing of the transmission speed
    - A slowing of nerve conduction velocity as the nerve passes through the carpal tunnel is suggestive of CTS



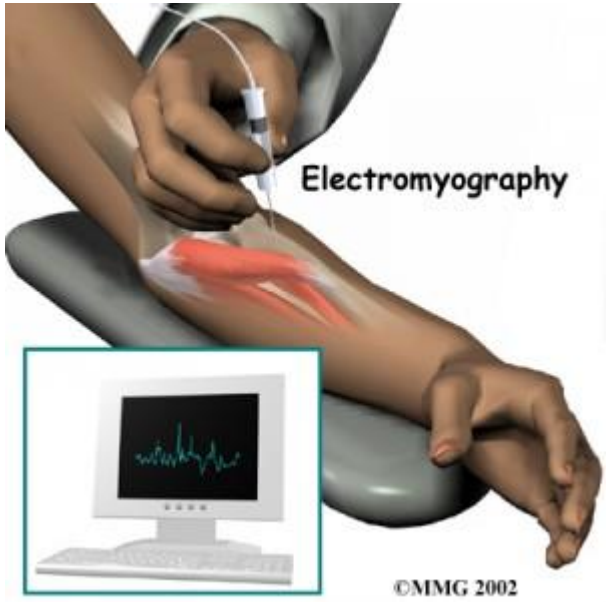
Carpal Tunnel Syndrome

Diagnosis

- Electrodiagnostics

EMG

- Fine needle inserted into muscle to record electrical activity
- Can give a hint to the condition of the nerve that controls that muscle



Carpal Tunnel Syndrome

Diagnosis

- Electrodiagnostics
  - CAUTION!!!
  - Abnormal electrodiagnostics can occur absent clinical symptoms of CTS.
  - An abnormality on nerve studies does not mean that the abnormality is causing symptoms in question
  - Don’t treat CTS based on abnormal electrical testing absent a clinically typical symptom presentation.

Carpal Tunnel Syndrome

Diagnosis

- PITFALL SCENARIO:
  - Claimant with some set of symptoms that are hard to explain
  - Symptoms NOT typical for CTS
  - Physician scrounges for explanation – starts ordering tests, OR claims management suggests electrical testing
  - Electrodiagnostics show some extent of CTS – perhaps mild
  - CTS becomes the scapegoat diagnosis
  - CTS Surgery is performed
  - Symptoms do not resolve



Carpal Tunnel Syndrome

Treatment that will NOT work

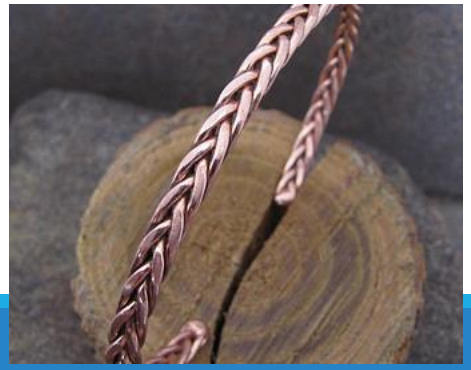
- Vitamins (including B6)
- Copper bracelets
- Magnets
- Sticky tape things
- Topical ointments
- Herbal remedies
- Adjustments
- Manipulations
- Lasers
- Acupuncture











Carpal Tunnel Syndrome

Treatment

- **Control** vs **Cure**

Carpal Tunnel Syndrome

Treatment

- **Control** CTS (not cure)
  - Splints
    - Night
  - Therapy
    - PT/OT (hand therapy)
    - Home exercises
  - NSAIDs (anti-inflammatory meds)
  - Ergonomics/activity modification – maybe
  - Rest – not unless something else changes moving forward
  - Conservative management most likely to work in situation OUTSIDE OF A CLAIM

Carpal Tunnel Syndrome

Treatment

- **Control** CTS (not cure)
  - Corticosteroid injection
    - Very effective but transient relief (80% recurrence)
    - Useful in pregnancy
    - Can be a diagnostic test as well as treatment
      - If injection gives relief it is somewhat a predictor as to the likely success with surgery

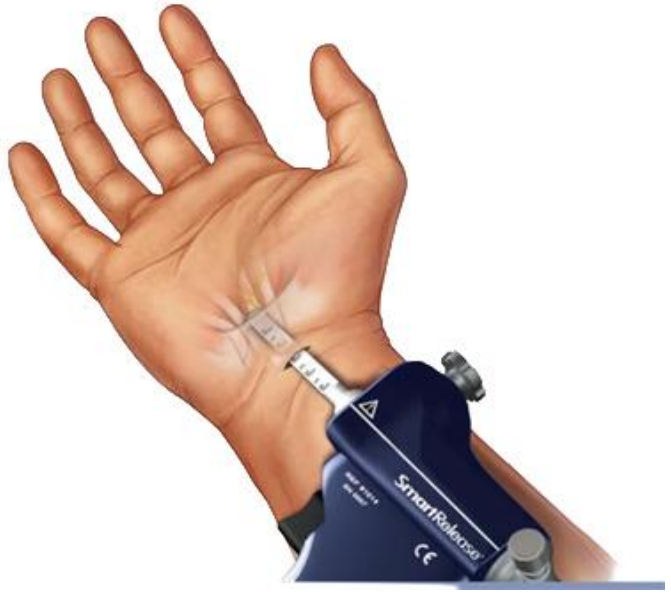


Carpal Tunnel Syndrome

Surgical Treatment

- Open Carpal Tunnel Release (CTR)
- Endoscopic CTR
- Benefit of Endoscopic CTR is earlier return to activity. Otherwise, long term results similar





Carpal Tunnel Syndrome

Surgical Treatment

- Surgery is outpatient
- Takes about 6-10 minutes
- Can use hand right away
  - Light duty in 1 to 7 days
  - Moderate duty in 2-6 weeks
  - Heavy work in 4-12 weeks
- Long term impairment should be minimal in most cases

Carpal Tunnel Syndrome

Surgical Treatment

- Recurrence rate is <5%
- Prognosis is best when
  - Very typical symptoms are present pre-op
  - Not work comp!
- Surgical failure most commonly caused by misdiagnosis, not any fault of the procedure
  - “Surgery for carpal tunnel doesn’t work so well to help your symptoms if your symptoms are not from carpal tunnel.”
- Complications exist but are uncommon

Carpal Tunnel Syndrome

Surgical Treatment

- With such a “rosy” picture of surgical treatment, why do we see so many postsurgical messes in claimants?
- It has less to do with the nerve condition and more to do with how the problem is processed by the individual.
- People with claims do more poorly
  - Residual symptoms are more common and can be much greater than would be expected by objective measures (repeat electrodiagnostics).

Carpal Tunnel Syndrome

Pitfall scenario:

Claimant has CTS (often mild) by electrodiagnostics.

- Has uncomplicated surgery
- Has residuals postop
  - Pain
  - Numbness
  - Whatever
- Repeat nerve studies are done and reveal some degree of “carpal tunnel syndrome”

Carpal Tunnel Syndrome

Pitfall scenario:

- Electrodiagnostician may or may not point out that there has been improvement since pre-operative study
- Surgeon opts to re-operate
- Chance of improvement is no better than random

Carpal Tunnel Syndrome

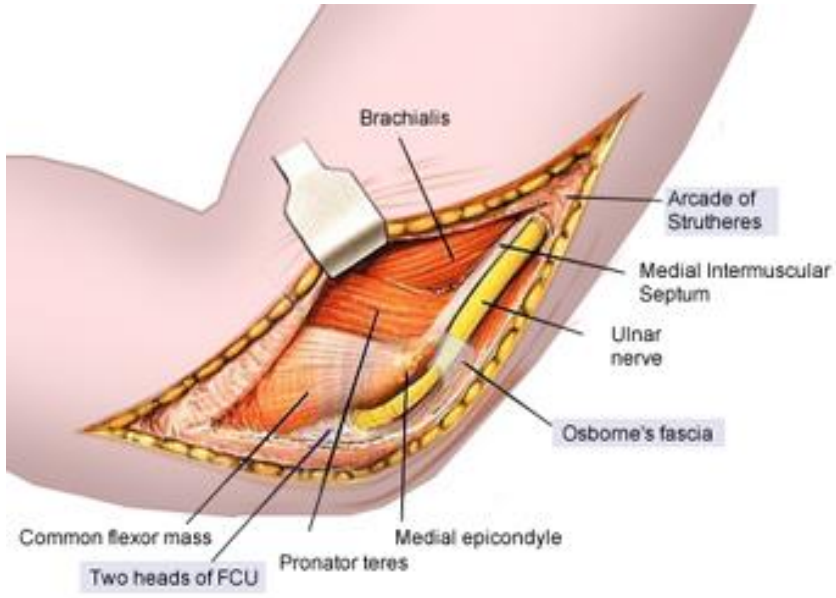
Pitfall scenario:

- PEARL:
  - Revision surgery should rarely be necessary in the several years after CTR surgery.
  - Electrodiagnostics typically improve after surgery but it is COMMONPLACE that they do not normalize.
  - Revision surgery absent equal or worse electrodiagnostics is typically not warranted irrespective of subjective complaints

Cubital Tunnel Syndrome

Definition

- Compression of the Ulnar Nerve as it passes behind the elbow
- The “funny bone” nerve

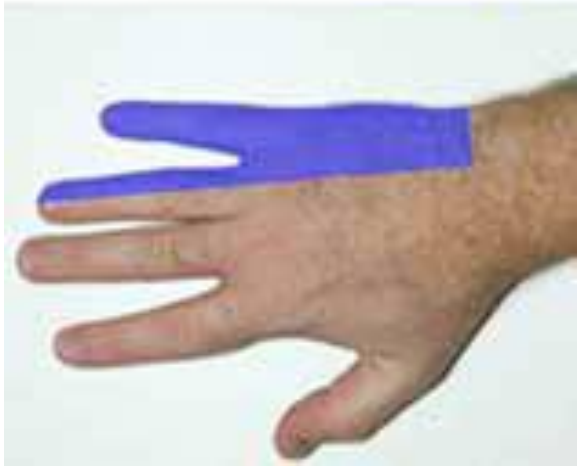


Cubital Tunnel Syndrome

Symptoms

- Numbness in the ulnar nerve distribution
- Pain from the elbow to hand
- Weakness in the small muscles of the hand
- Loss of fine coordination/dexterity
- Muscular wasting of hand (advanced stages)







Cubital Tunnel Syndrome

Causation

- Idiopathic
- Prolonged postures with pressure on elbow
- Prolonged postures with flexed elbow position
- Increases with age
- Diabetes
- Smoking

Cubital Tunnel Syndrome

Causation – occupational

- Combination of force and repetition or force and posture
- NOT
  - Keyboarding
  - Vibration
  - Repetitive use alone

Cubital Tunnel Syndrome

Causation – Per AMA Guides to the Evaluation of Disease and Injury Causation

- A myth has been perpetuated from one review to another to implicate repetitive stress injury as the cause for ulnar nerve compression in workers
- There is no credible medical literature to support this myth
- Case reports and cadaver studies provide tenuous support for high force situations
- Repetitive motion is not causative, but prolonged flexion of the elbow, or pressure on the nerve at the elbow can be provocational.

Cubital Tunnel Syndrome

Diagnosis

- Clinical history
- Clinical exam
  - Decreased sensation
  - Motor weakness
  - Tinel's sign
  - Elbow flexion test
- Electrodiagnostics
  - Gold standard
  - False negatives and positives

Cubital Tunnel Syndrome

Treatment : **Control**

- Sleep with the elbow straighter
- Avoid armrests that place pressure on elbow
- Phone headset/Bluetooth
- Don’t lean on elbows
- Ergonomic adjustments as above

Cubital Tunnel Syndrome

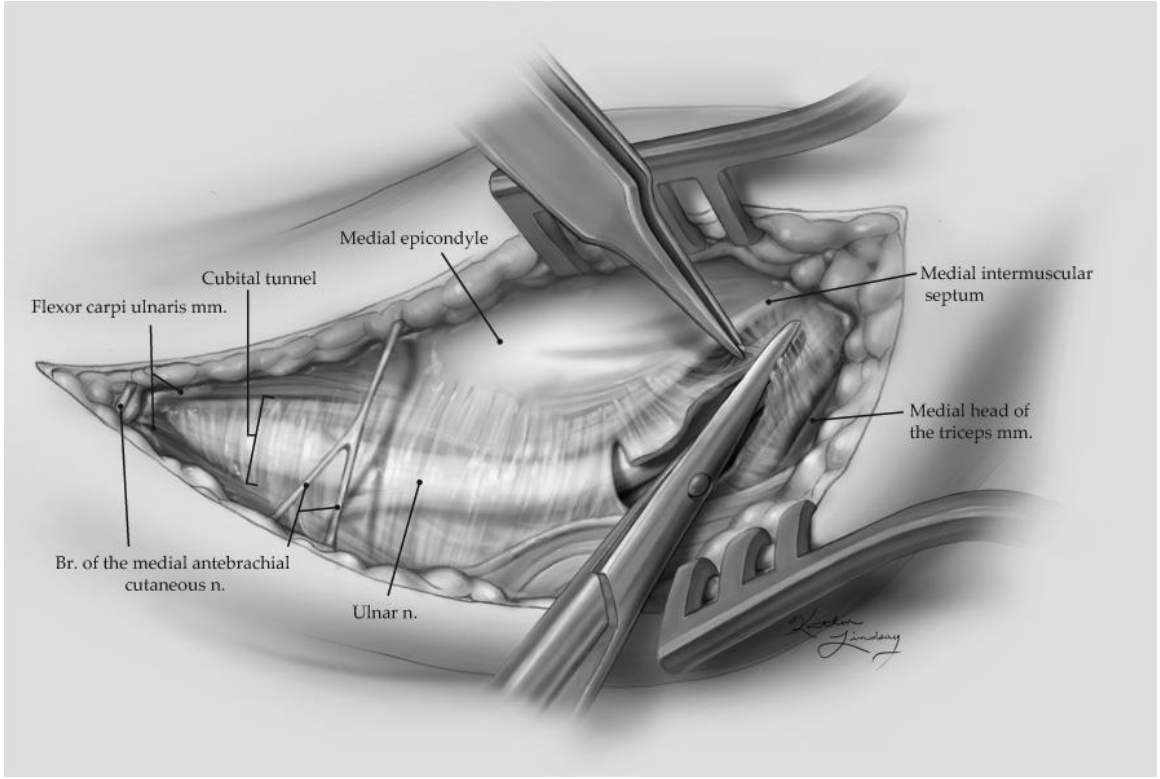
Treatment : **Control**

- NOT EFFECTIVE
  - Injections
  - Physical Therapy
  - Medications
  - Splints (other than at night)

Cubital Tunnel Syndrome

Treatment : Cure - Surgery

Ulnar Nerve Decompression

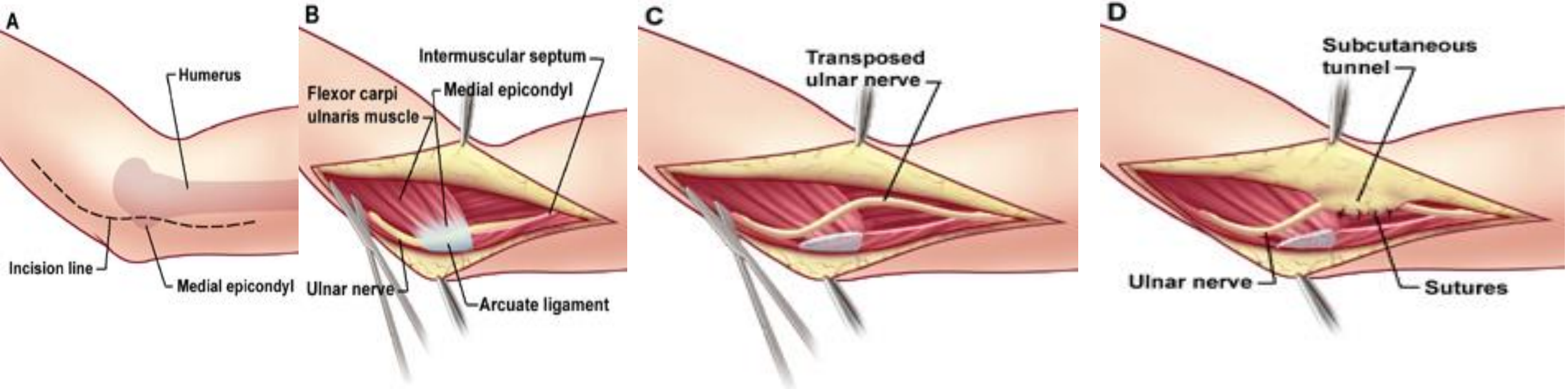


Cubital Tunnel Syndrome

Treatment : Cure - Surgery

Ulnar Nerve Transposition

- Nerve is decompressed and moved to a more relaxed position



Cubital Tunnel Syndrome

Surgery

- Fairly reliable
- Reasonably speedy recovery, similar to CTS surgery
- Low recurrence rate

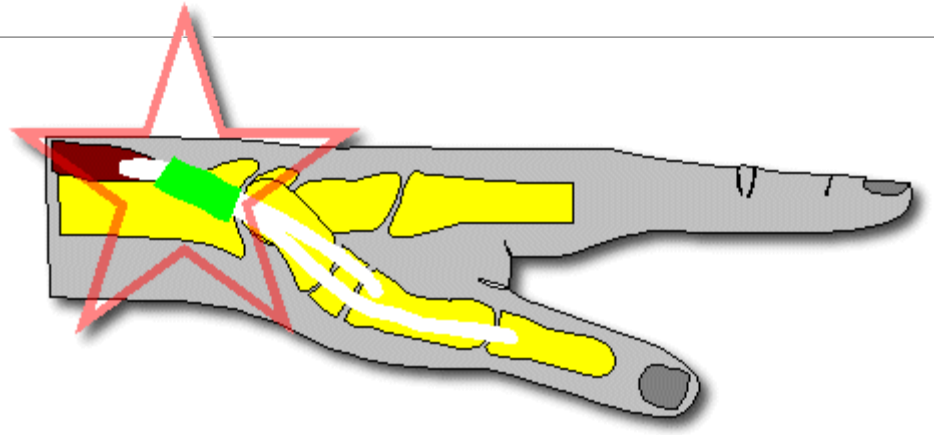
deQuervain’s Tendonitis

Radial sided wrist pain (thumb side)

Should localize well

Less pain at rest

Sharp pain with motions

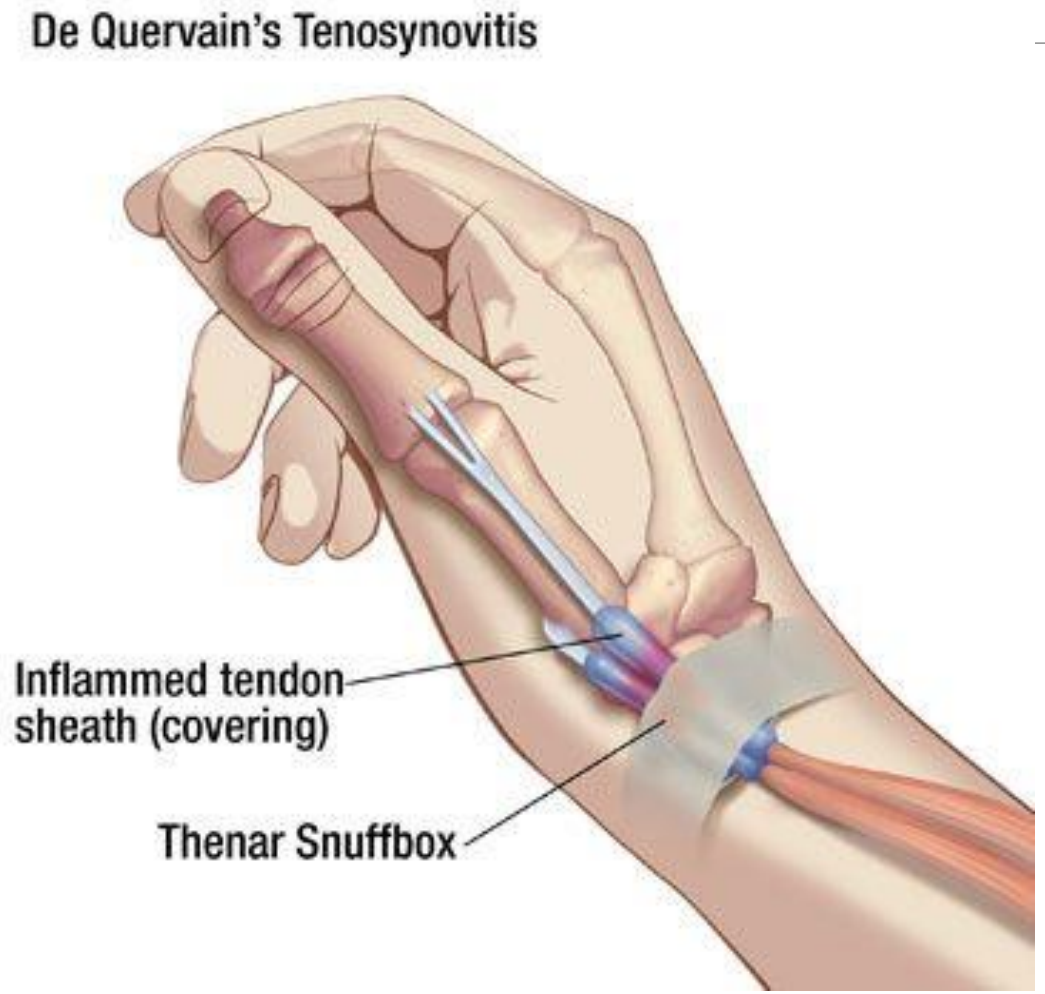




deQuervain's Tendonitis

Anatomy

- First extensor compartment contains two tendons
  - APL – abductor pollicus longus
  - EPL – extensor pollicus brevis

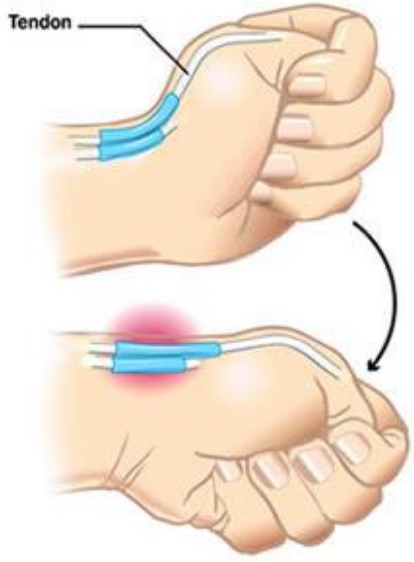


deQuervain's Tendonitis

Diagnosis

- Local tenderness
- Local swelling
- Local erythema
- Crepitation, clicking
- Finklestein's maneuver
- No X-ray or MRI needed
- Clinical diagnosis





deQuervain's Tendonitis

Risk factors

- Female gender 5:1
- Age: Women in 50's, Men in 30's
- Anatomic variation
  - In individuals where the first extensor compartment is split into 2 compartments there is much greater risk

deQuervain's Tendonitis

Causation

- Some evidence for activities that include
  - Combination (force and repetition, force and posture)
  - Force alone
  - NOT
    - Keyboarding
    - Vibration
    - Awkward postures alone

deQuervain's Tendonitis

Causation - example

- The motion of lifting a toddler
- Moms with twins are a setup
- The motion of radial deviation



deQuervain's Tendonitis

Treatment – conservative

- Bracing
- Hand therapy
- Activity modification



deQuervain's Tendonitis

Treatment - Injection

- Corticosteroid into first extensor compartment
- 90% successful if diagnosis is correct
- Recurrence not uncommon
- Can repeat once

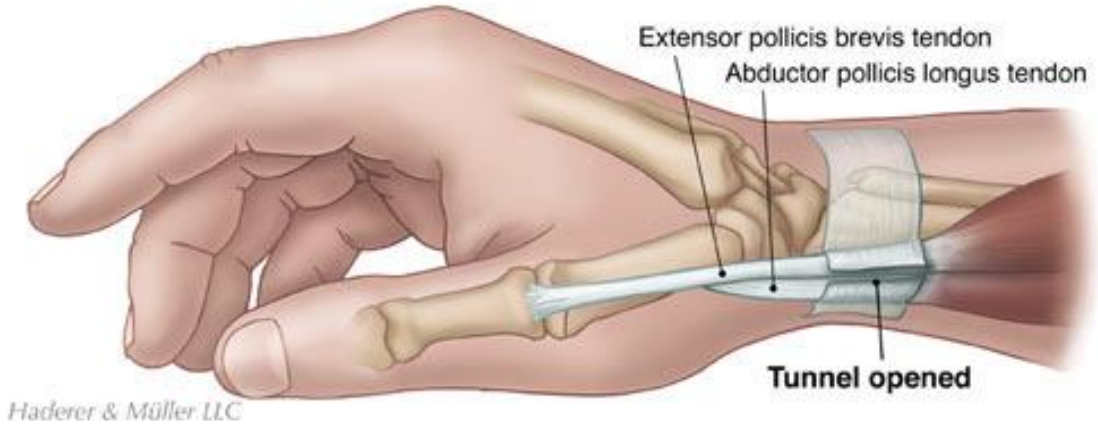


deQuervain's Tendonitis

Treatment - Surgery

- Divide the roof of the compartment to decompress space
- Highly successful
- Return to activity over 2-10 weeks typical





Trigger Finger

Painful catching and locking of a finger or fingers

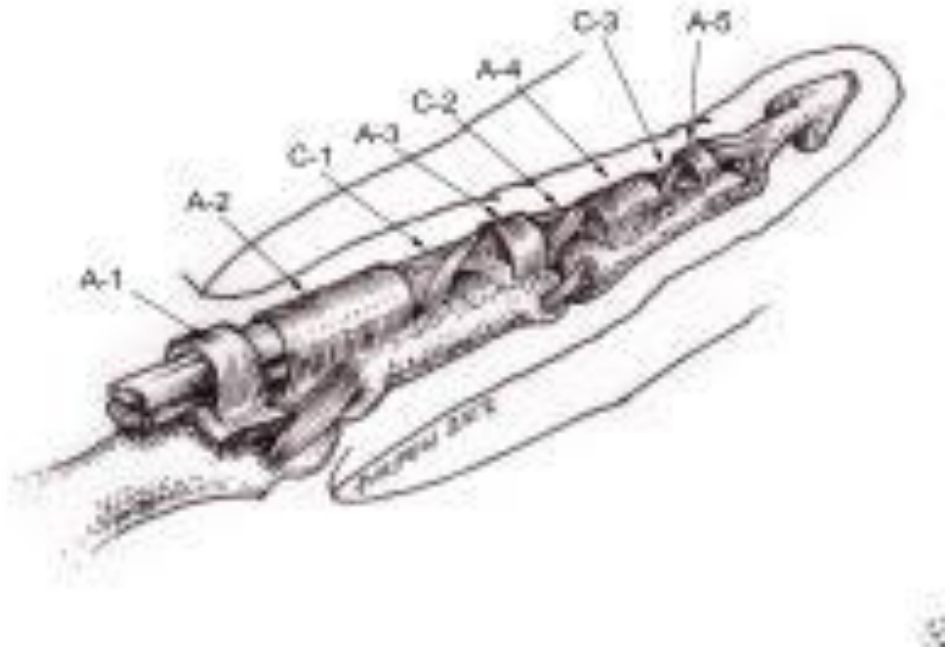
- Usually develops insidiously
- Any digit involved
- Usually worse in morning, improves with warm up
- Pain with gripping
- Finger often needs to be passively “unlocked”
- Sometimes occurs without much locking or popping
- A form of tendonitis

Trigger Finger

Anatomy

Digital flexor tendons

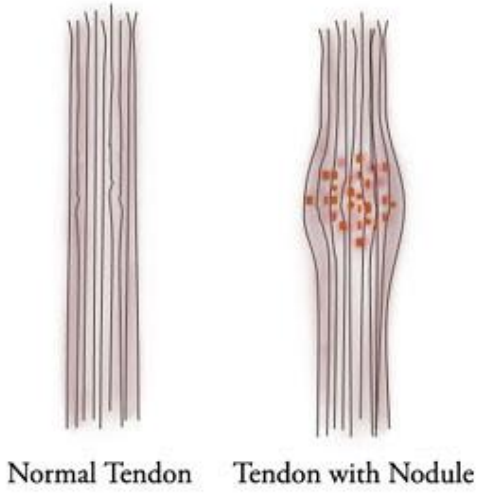
- Very strong and thick
- Two per finger, one for thumb
- Travel along finger tightly through a sheath consisting of a series of pulleys



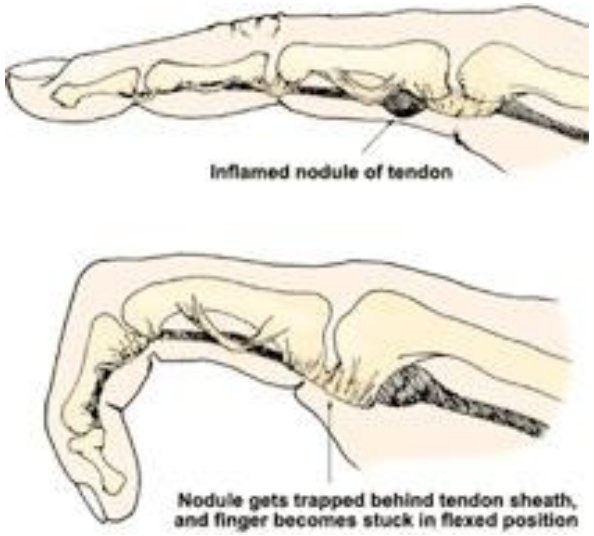
Trigger Finger

Pathophysiology

- Tendon develops thickening
  - Collagen bunching
  - Tenosynovial swelling



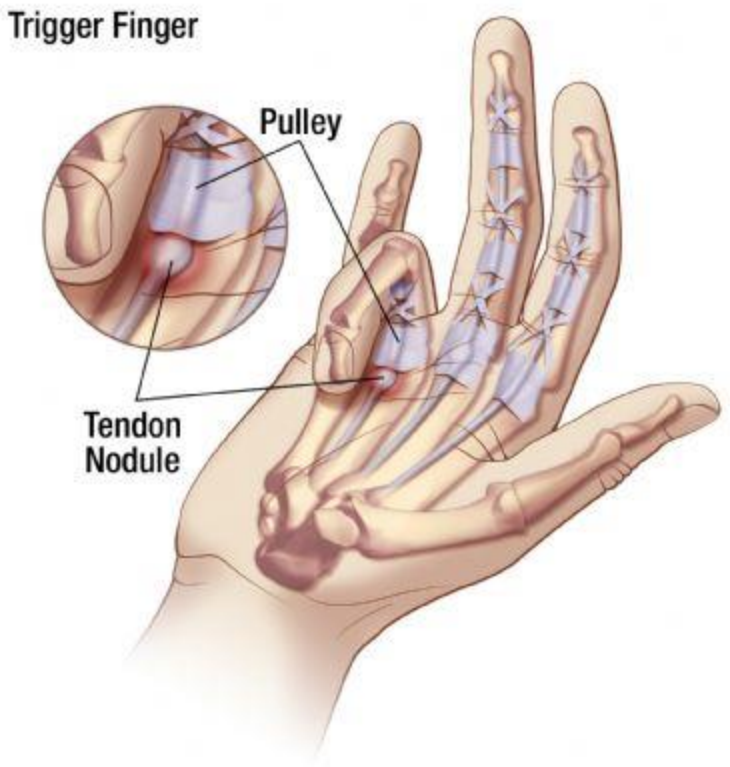




Trigger Finger

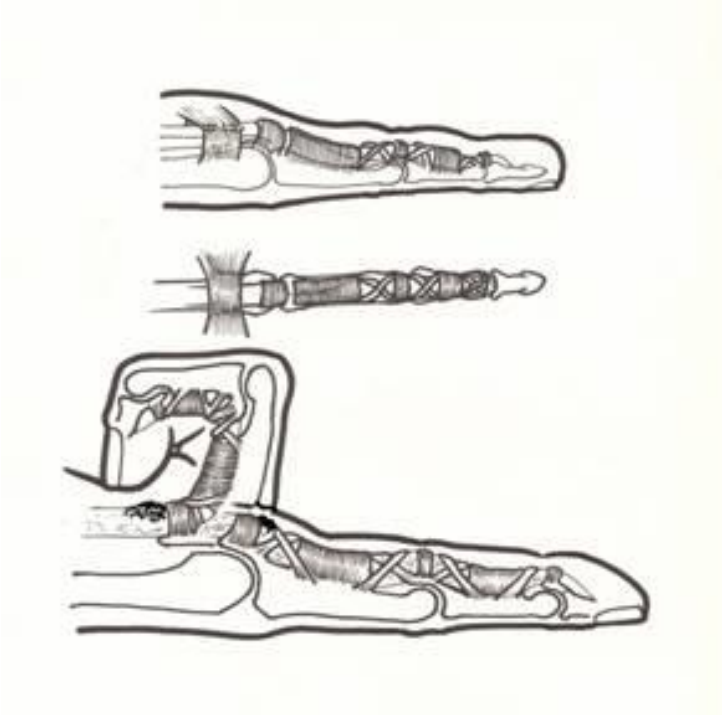
Pathophysiology

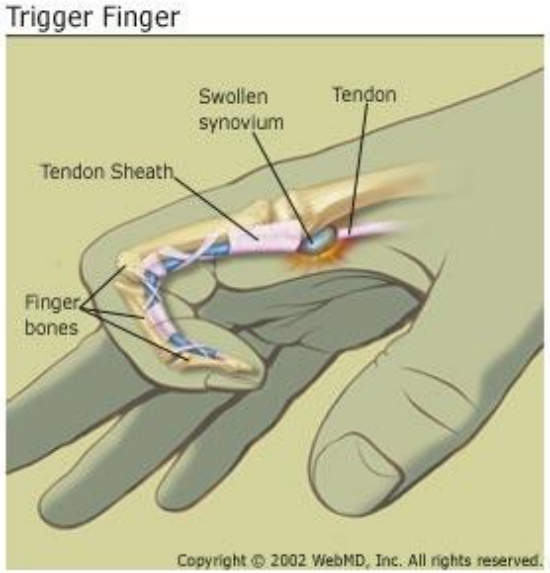
- The tendon and the tendon lining (tenosynovium) become thickened and form a lump
- As the tendon(s) pull through the flexor sheath it catches on the first pulley
- The finger then can catch or lock

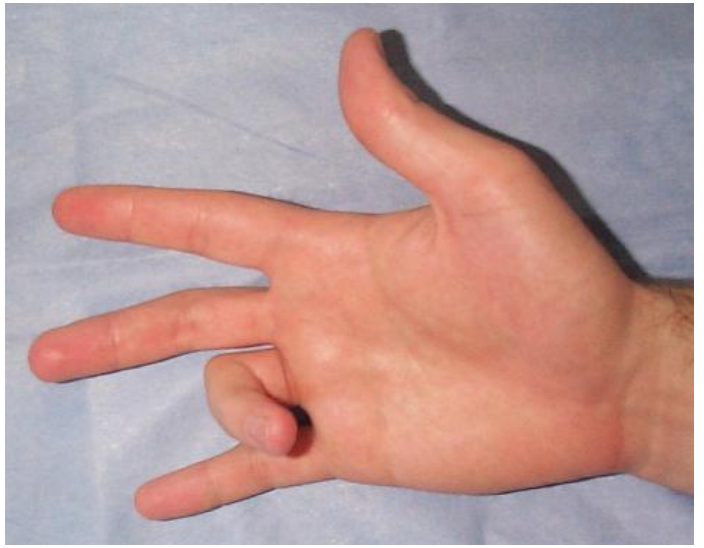


Trigger Finger

Pathophysiology







Trigger Finger

Causation

- Risk factors
  - Diabetes
  - Rheumatologic conditions
  - Female gender
  - Obesity mild risk factor

Trigger Finger

Causation

- Occupational causes
  - Similar to carpal tunnel syndrome
  - Forceful and repetitive grasping
  - Vibration
  - Combination of factors
  - NOT
    - keyboarding

Trigger Finger

Causation

- Does Carpal Tunnel Syndrome or Carpal Tunnel Surgery CAUSE Trigger finger?
- There is some controversy
  - Studies show association
  - Both Trigger Digit and CTS share underlying pathophysiologic causes
    - People with CTS get Trigger finger
    - People with Trigger finger get CTS

Trigger Finger

Causation

- While studies show that trigger digit occurs at a greater incidence after CTS surgery…
- Trigger digit is also at greater incidence in the year PRIOR to CTS surgery

- ASSOCIATION IS NOT CAUSATION

Trigger Finger

Diagnosis

- By history and physical exam alone
- No x-ray or other imaging needed

Trigger Finger

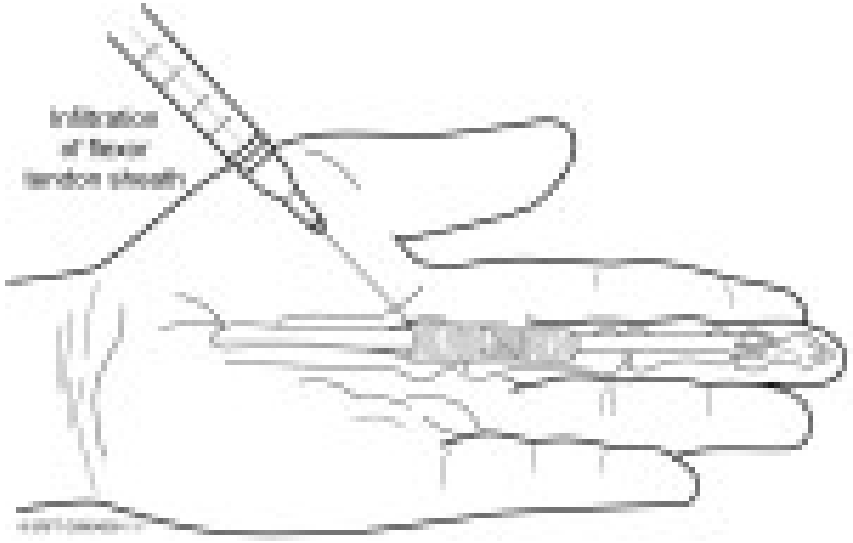
Treatment – therapy

- Possibly helpful
- Slow
- Expensive
- Unreliable

Trigger Finger

Treatment – injection

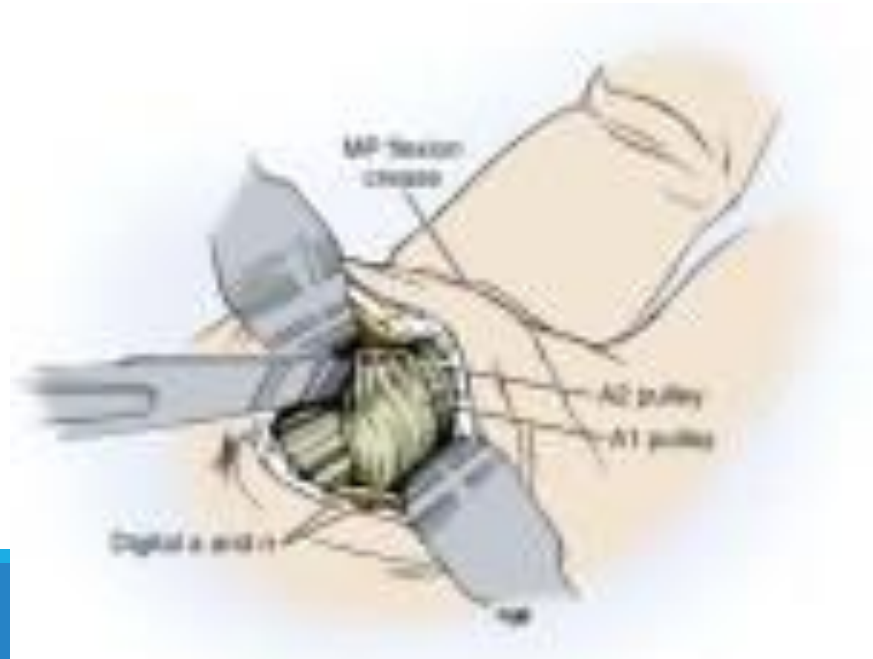
- Corticosteroid injected into the sheath around the tendon
- 90% improvement in 90% of fingers
- Recurrence rate is over 30% with time
- Can be repeated but probably no more than 2 to 3 injections per finger
- Improvement in days to weeks

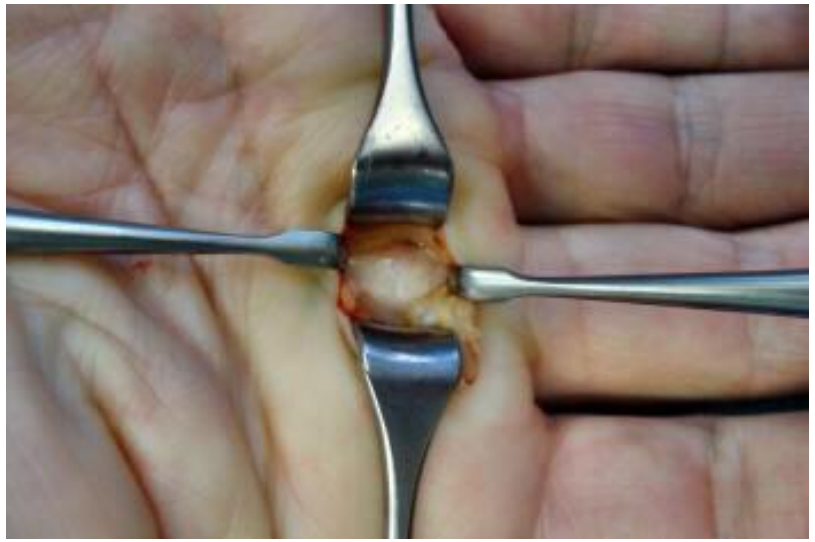


Trigger Finger

Treatment – Surgery

- Divide the first pulley of the flexor sheath
- Definitive, high success rate
- Rare recurrence





Trigger Finger

Treatment – Surgery

- Recovery
  - Return to desk work in 1-4 weeks
  - Return to heavier activity in 3-8 weeks

Lateral Epicondylitis

The most common cause of elbow pain

Over 80% of ALL elbow pain

AKA “Tennis Elbow”

- In my practice <1% play tennis

An ENTHESOPATHY

Pain at the origin/anchor of the Extensor Carpi Radialis (wrist extensor)

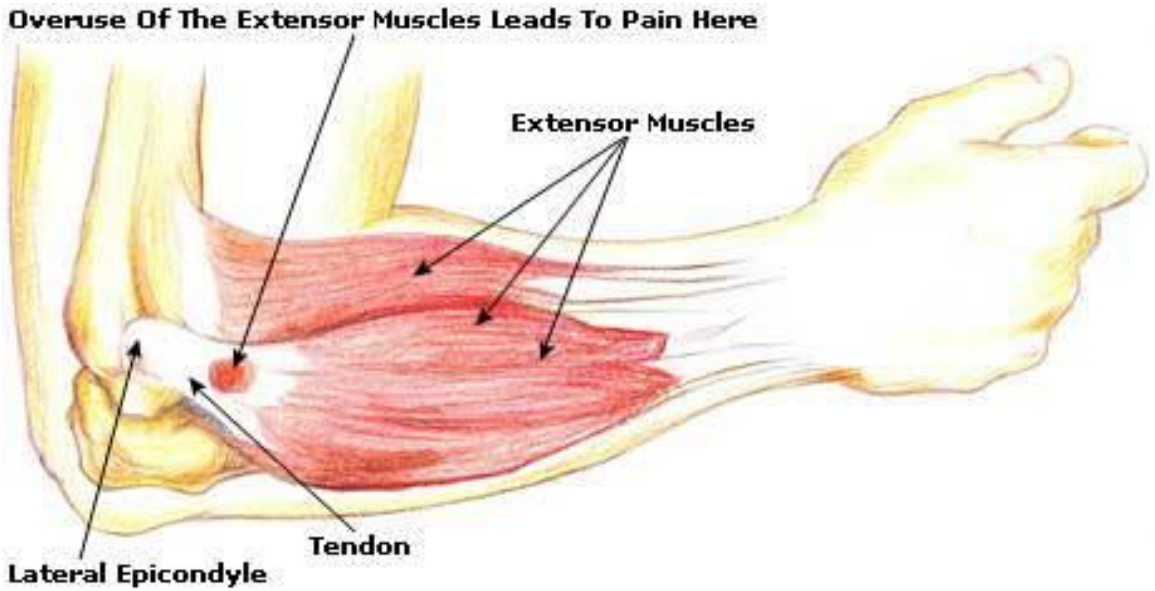
Lateral Epicondylitis

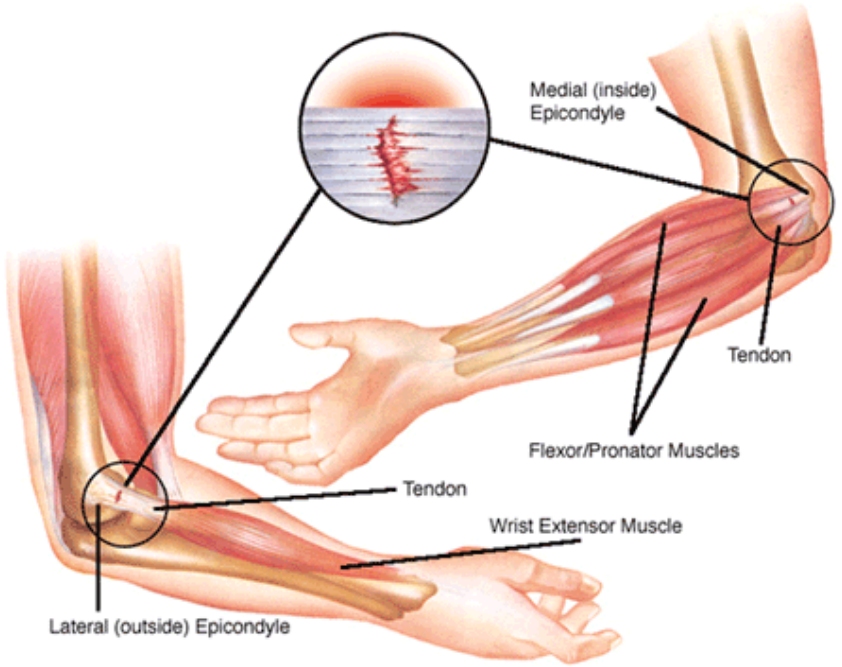
Symptoms

- Lateral elbow pain right at the bony knob
- Pain with overhand lifting
- Pain with forceful grasping
- Pain with supination
- Pain can radiate up or down arm but originates in lateral elbow
- Very tender to touch
- Later can develop secondary elbow stiffness

Lateral Epicondylitis

Anatomy

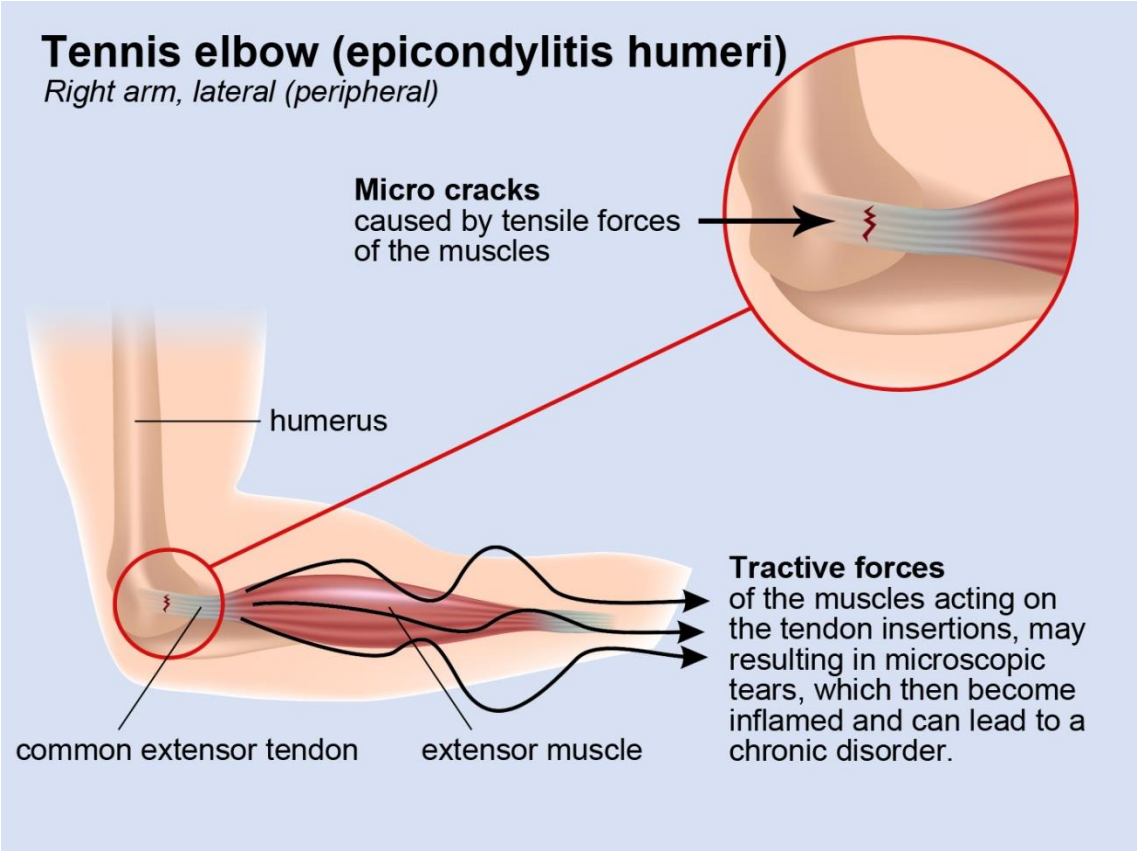




Lateral Epicondylitis

Pathophysiology

- Repetitive microtrauma to extensor origin (enthesis) creating an enthesopathy



Lateral Epicondylitis

Epidemiology

- No specific risk groups
- Common problem

Lateral Epicondylitis

Causation

- Usually develops over time
- Occasionally develops acutely
  - Acute pull or jerk
  - Contusion can set it off
- Strong evidence for force and repetition
- Not
  - Vibration
  - Keyboarding
  - Repetition without force

Lateral Epicondylitis

Examination

- Localizing tenderness
  - Has to be the right spot
- Provocation of pain
  - Resisted wrist extension
  - Resisted supination

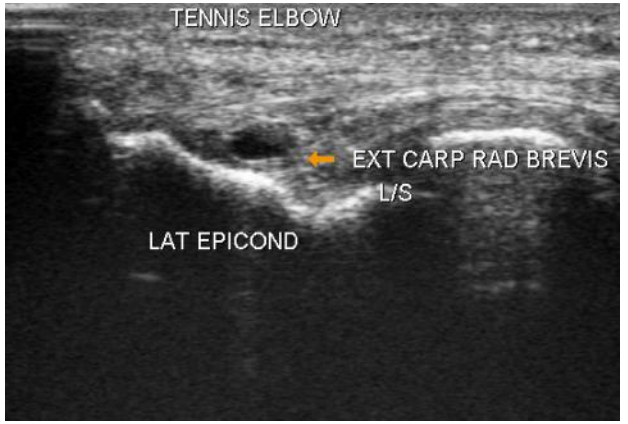


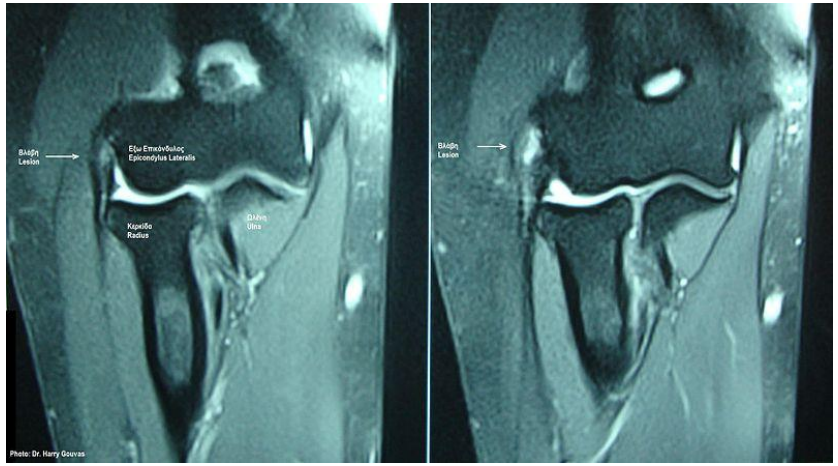


Lateral Epicondylitis

Diagnosis is clinical

- History and examination
- Imaging
  - Generally not necessary
  - X-rays only rule out other problems, don’t show it
  - MRI can show changes and provide objective findings.
  - Ultrasound can be diagnostic
  - Issues with specificity





Lateral Epicondylitis

Natural history

- Resolves spontaneously in most cases
  - Can take 6-18 months
  - Prolonged symptoms with prolonged exposure to provocational activities

Lateral Epicondylitis

Treatment -conservative

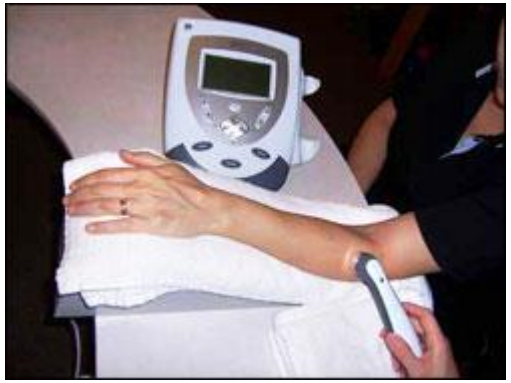
- Activity modification
- Therapy (home and/or PT)
  - Stretches
  - Manipulation/Massage/Mobilization
  - Ultrasound/Heat/Iontophoresis/Modalities
- Tennis Elbow strap













Lateral Epicondylitis

Treatment – Injection

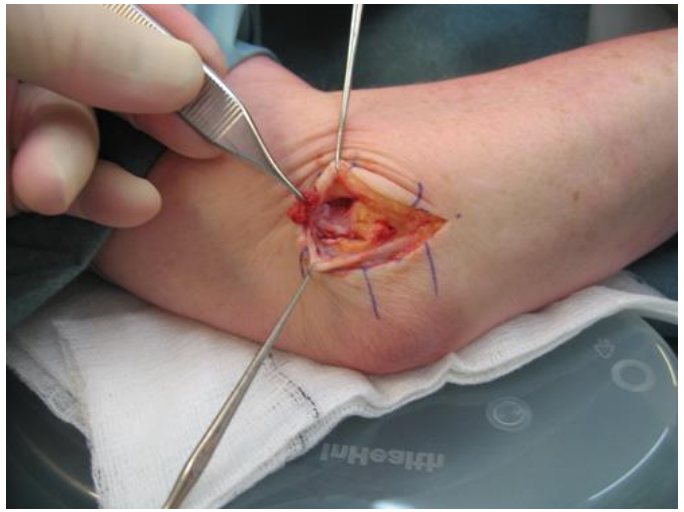
- Corticosteroid
  - Helpful short term but not long term
  - Diagnostic
  - Allow pain free window for therapy
- Blood
  - Not proven effective
- PRP (platelet rich plasma)
  - Not approved by most payors
  - Not yet proven

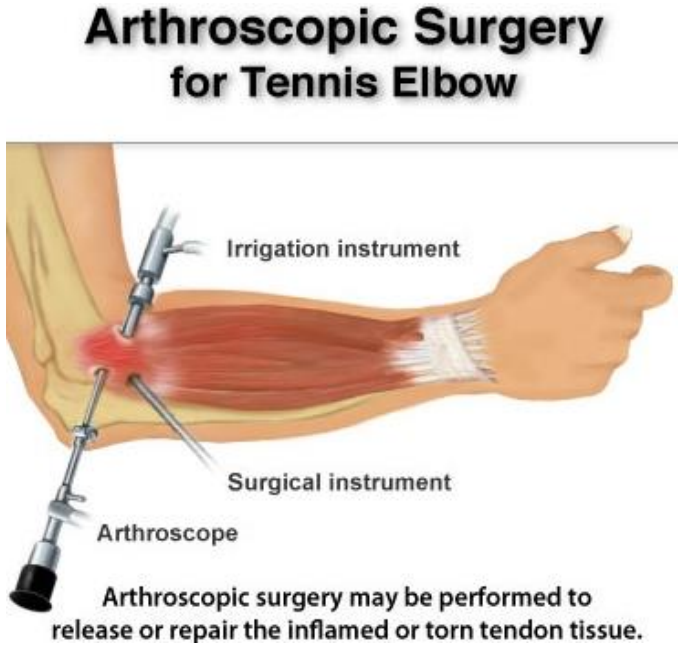


Lateral Epicondylitis

Surgery

- Open area and remove damaged segment of tendon
  - Arthroscopic
  - Open
  - Special instrumentation
- Jump start healing process





Lateral Epicondylitis

Surgery

- Try to avoid – not a super solid procedure
- Significant risk of residual symptoms
  - 50% with significant improvement
  - 25% with partial improvement
  - 25% with no improvement
  - 5% worse
  - Recurrence possible

Lateral Epicondylitis

Summary

- Tough work comp diagnosis
- Prolonged treatment
- Paucity of objective findings
- Return to activity needs to be gradual
- Symptoms can come and go

Medial Epicondylitis

The second most common cause of elbow pain

AKA “Golfer’s Elbow”

- In my practice <1% play golf

An ENTHESOPATHY

Pain at the origin/anchor of the wrist flexors

Not quite as common as lateral epicondylitis (?10:1)

Medial Epicondylitis

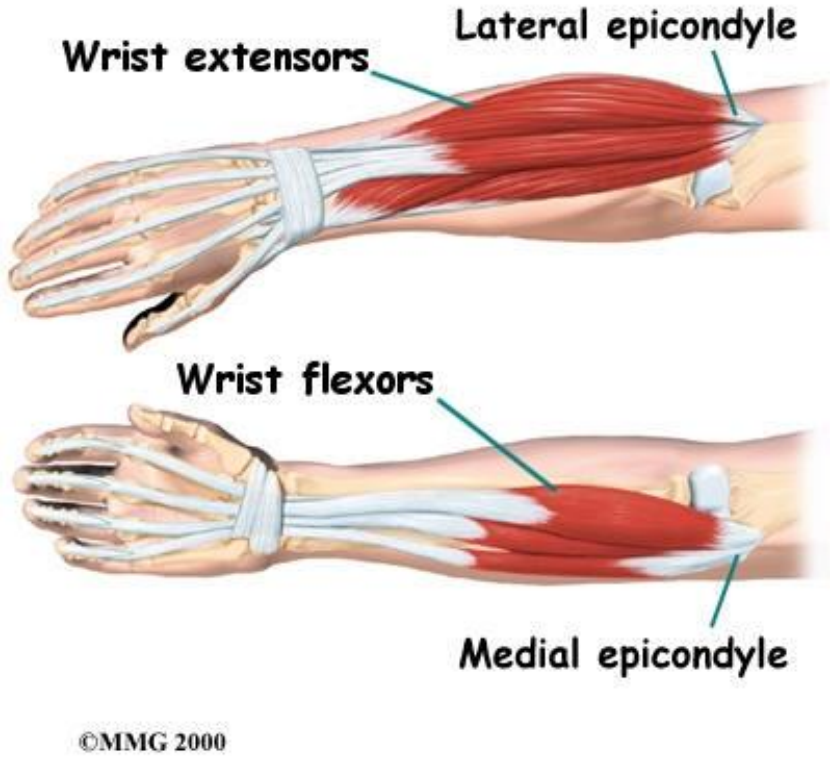
Symptoms

- Medial elbow pain right at the bony knob
- Pain with underhand lifting
- Pain with forceful grasping or pulling
- Pain with pronation
- Pain can radiate up or down arm but originates in medial elbow
- Very tender to touch
- Later can develop secondary elbow stiffness

Medial Epicondylitis

Pathophysiology

- Similar to lateral epicondylitis but opposite side of elbow and forearm



Medial Epicondylitis

Causation

- Similar to Lateral Epicondylitis
- Acute injuries can include a pulling and jerking action
- Usually progresses over time

Medial Epicondylitis

Examination

- Localizing tenderness
  - Has to be the right spot
- Provocation of pain
  - Resisted wrist flexion
  - Resisted pronation

Medial Epicondylitis

Diagnosis

Imaging

Natural History

Treatment

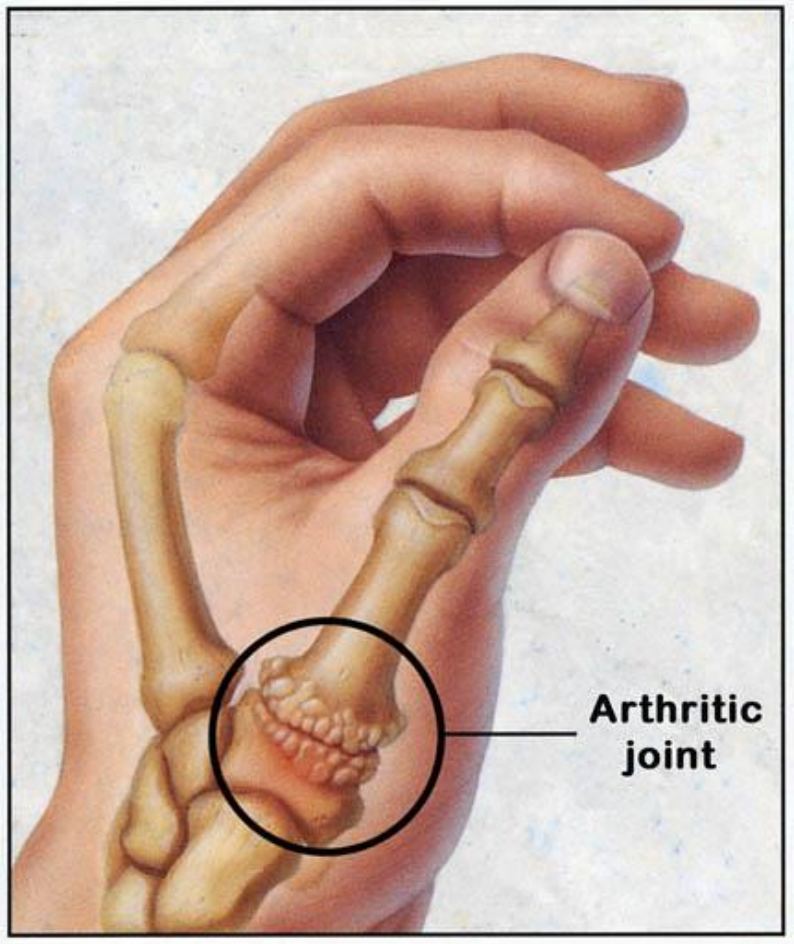
Prognosis

SAME AS LATERAL EPICONDYLITIS

Thumb Osteoarthritis

Pathophysiology

- Thumb Carpometacarpal joint affected
- Complex, high demand joint, accounts for the huge majority of symptomatic osteoarthritis in the hand
- Wear and tear
- Degenerative Arthritis



Thumb Osteoarthritis

Symptoms

- Pain at base of thumb
- Decreased ROM of thumb
- Decreased strength, especially in pinch



Thumb Osteoarthritis

Epidemiology

- Age
- Gender – Female: Male = 7:1
  - 20% of all women over the age of 40 years have some signs of osteoarthritis of the thumb.
- Genetics
- Prior Trauma

Thumb Osteoarthritis

Causation

- Controversial
- Awkward positioning may be contributory
- Forceful work was shown not to be a factor in a prospective study of 8000 Fins
  - Arthritis developed similarly independent of work history.

Thumb Osteoarthritis

Diagnosis

- Clinical exam
  - Swelling
  - Deformity
  - Localizing pain
  - Crepitation (grind test)
  - X-ray – gold standard
  - No MRI needed



Thumb Osteoarthritis

Treatment – Conservative

- NSAIDs
- Bracing
- Activity Modification





Thumb Osteoarthritis

Treatment – Corticosteroid Injection

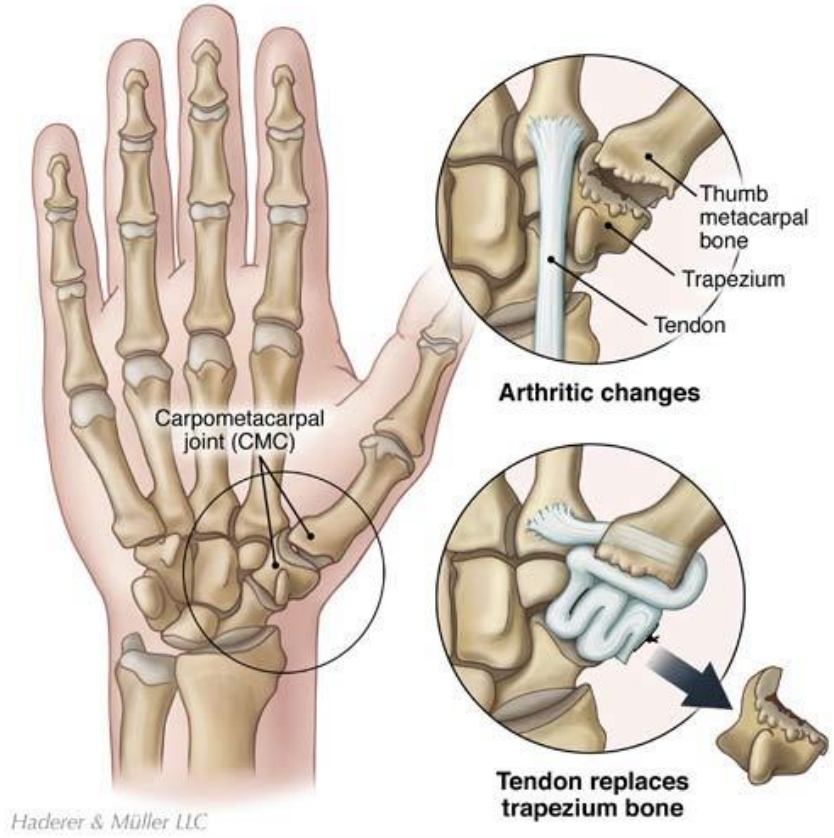
- Usually gives good relief
- Symptoms almost always recur in 3-6 months



Thumb Osteoarthritis

Treatment – Surgery

- Most common procedure is trapezium excision with ligament reconstruction and tendon interposition
- No implant
- Long track record of success



Thumb Osteoarthritis

Treatment – Surgery

- Use of implant or prosthetic replacement is typically not necessary and is usually contraindicated – high complication rate.



Just Say

NO





Thumb Osteoarthritis

Treatment – Surgery

- Slow recovery
  - 3-6 months or more
- Durable solution in most cases
- Reduction of pain
- Maintain motion
- Good improvement of strength but typically not normal

Ganglions

Most common cause for a “growth” lump or bump on the wrist joint

Most occur in typical locations

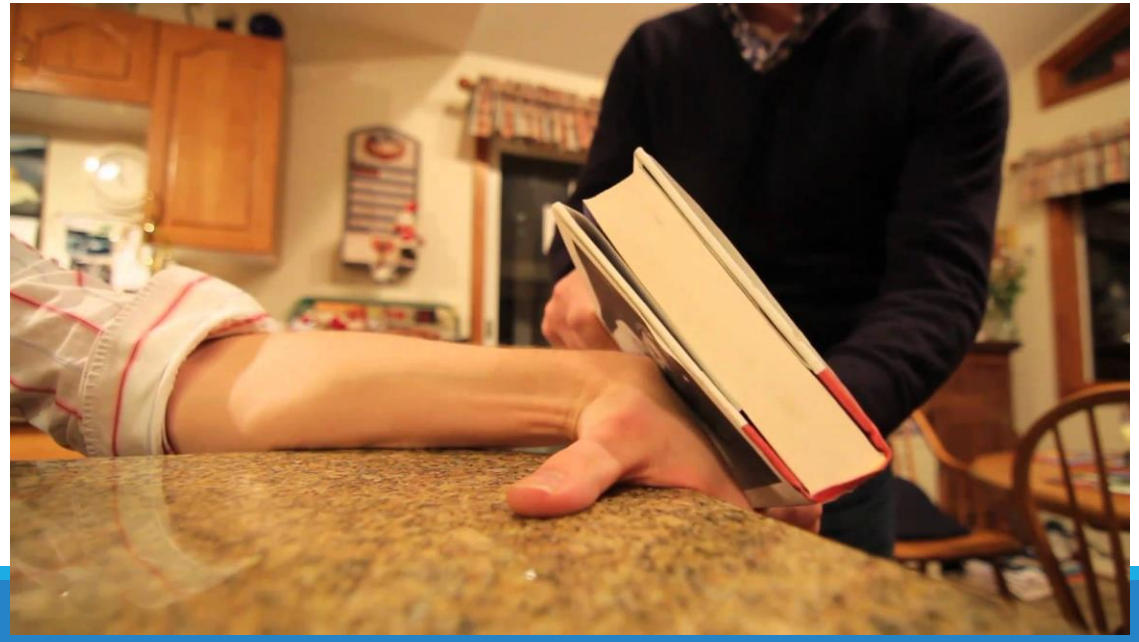
- Dorsal central
- Volar radial

Represent a contained fluid leakage or herniation of a fluid filled sack out of the wrist joint.

Ganglions

Also known as

- Wrist cysts
- Synovial cysts
- Bible bumps

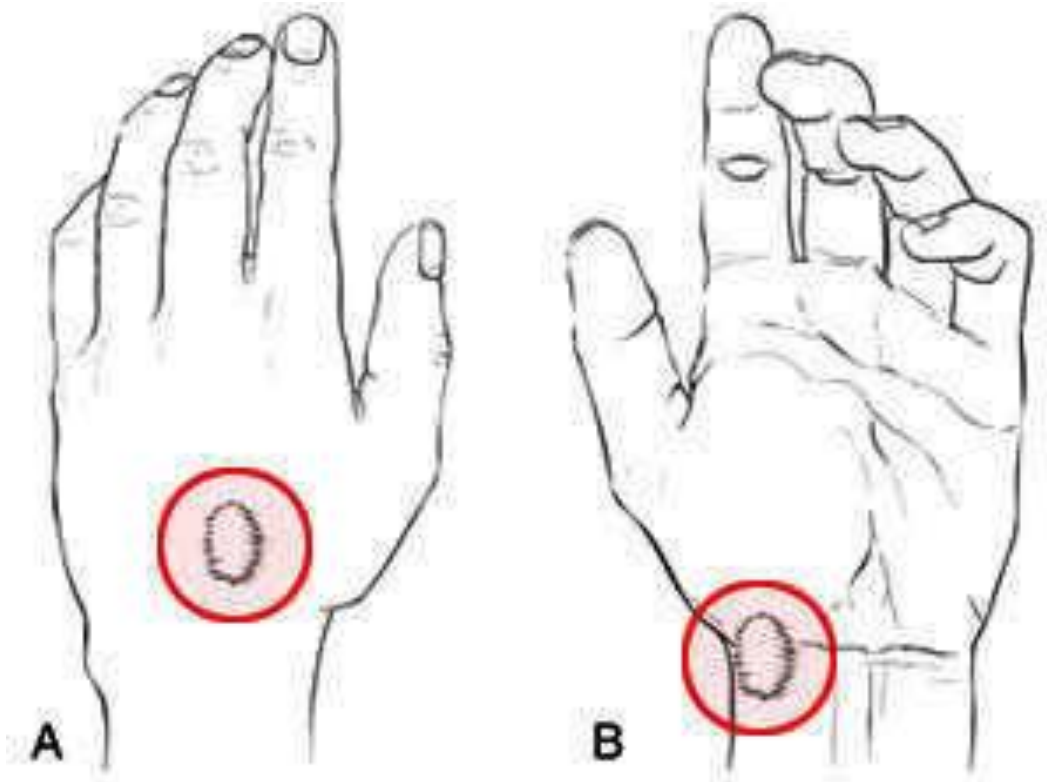


Ganglions

Appearance

Most occur in two typical locations

- Dorsal central
- Volar radial



Ganglions

Appearance





Ganglions

Pathophysiology

- Most joints have normal fluid within them contained in a space around the joint – the joint capsule
- Something (???) causes a leak or herniation of the fluid contained in a balloon or cyst
- Some describe trauma
- Some describe activity
- Thought to be generally idiopathic



Ganglions

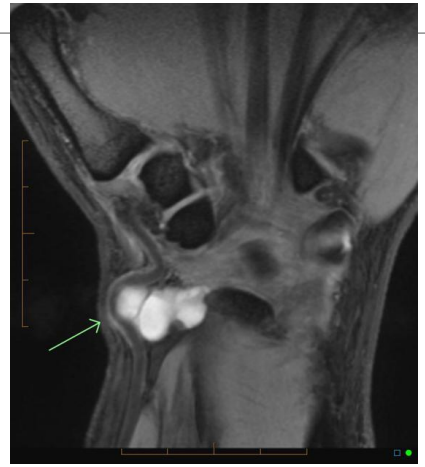
Symptoms

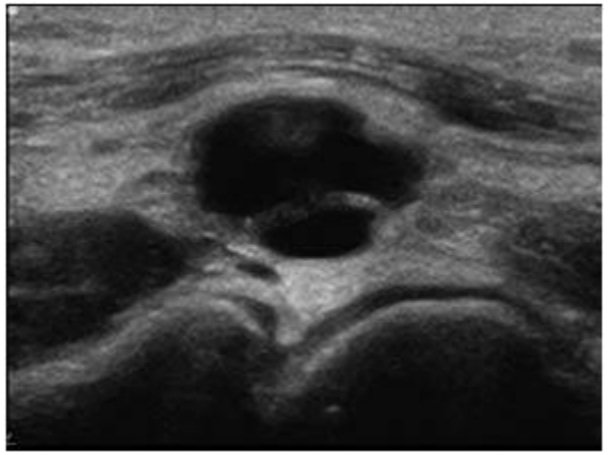
- Visible/Palpable lump or mass
- PAINFUL or PAINLESS
- Size does not dictate pain/symptoms
- Tightness
- Stiffness
- Vary in size by the day
- Cosmesis a factor

Ganglions

Diagnostic

- A clinical diagnosis by physical exam
- No imaging necessary
- MRI is diagnostic
- Ultrasound
- X-rays typically normal





Ganglions

Causation

- IDIOPATHIC
- Trauma
- Repetitive use
  - Little evidence to show the development of wrist cysts is related to any type of activity

Ganglions

Treatment - conservative

- Brace – comfort not cure



Ganglions

Treatment – Drainage

- Drain gel like liquid
- Inject corticosteroid, optional
- Dramatic resolution
- Recurrence in majority of cases

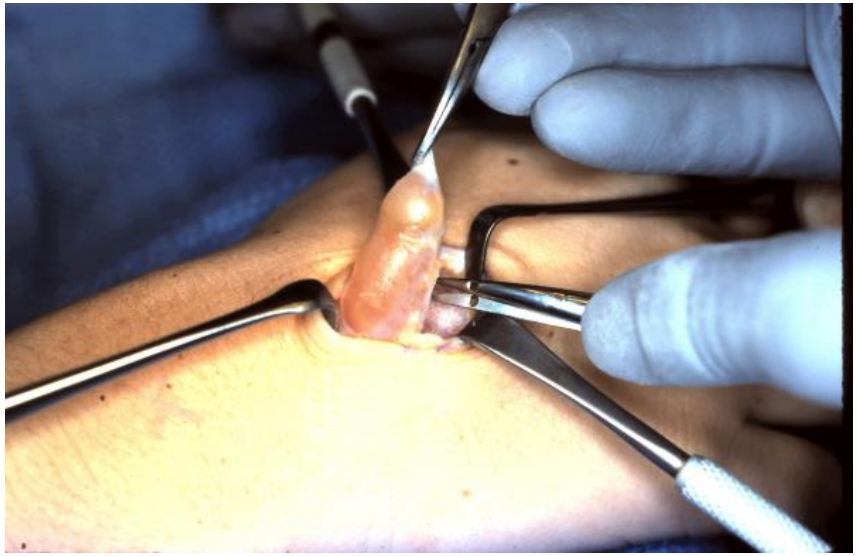




Ganglions

Treatment – Surgical

- Excision of cyst and stalk right down to joint capsule
- Causes an occlusive scar
- Recurrence rate still about 5%



Ganglions

Treatment – Surgical

- Recovery is
  - 1-4 weeks for light duty
  - 4-8 weeks for heavy duty

Rotator Cuff Disorders

Constellation of shoulder disorders

Common source of shoulder pain

Terminology and diagnoses are confusing

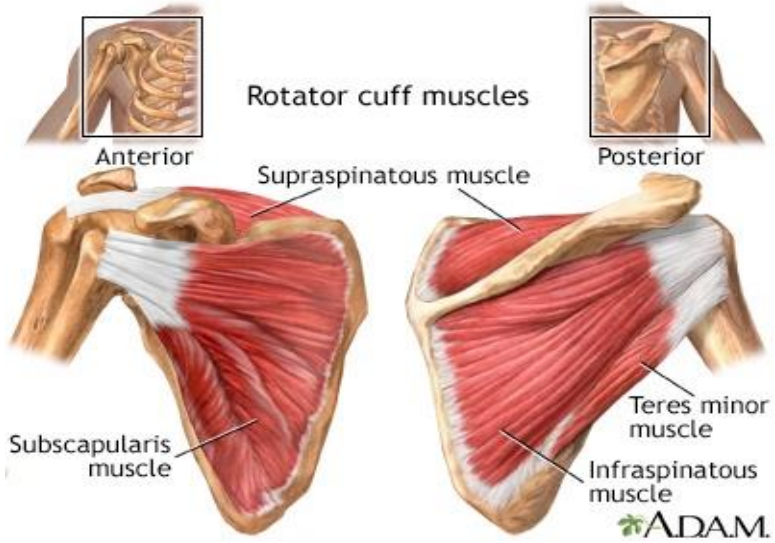
- Multiple diagnostic terms used interchangeably
- Sloppy use of descriptive terms

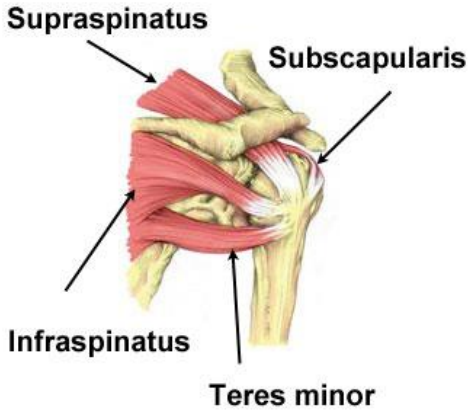
These disorders can be either occupational diseases or traumatic injuries

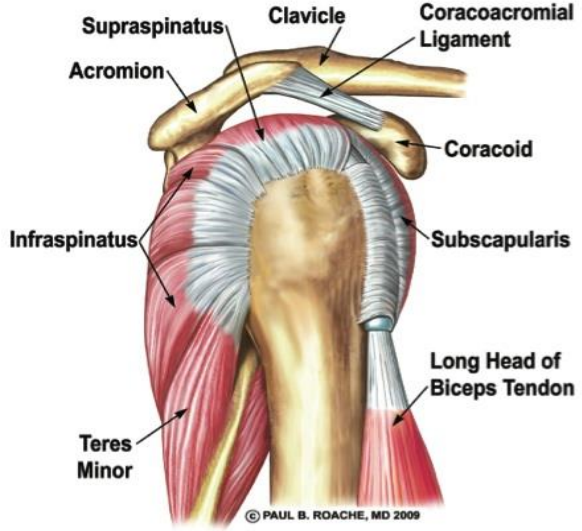
Rotator Cuff Disorders

Anatomy

- Cuff of muscles that act to hold the ball into the socket
  - Supraspinatus, infraspinatus, subscapularis, teres minor
  - Dynamic stabilizers that provide stability but allow motion







Rotator Cuff Disorders

Anatomy

- Acromion is a bony “roof” over the cuff
- The subacromial bursa is a lubricating sac/membrane separating the tendons from the underside of the acromion



Rotator Cuff Disorders

The rotator cuff tendons and bursa are prone to irritation and inflammation due to wear and tear

This can progress to thinning or a frank tear of the tendon(s)

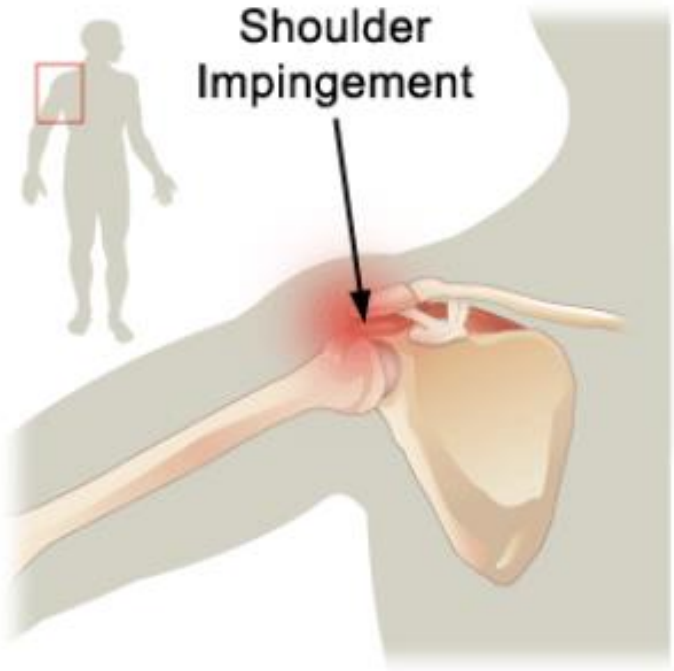
Injuries can be acute or develop over time

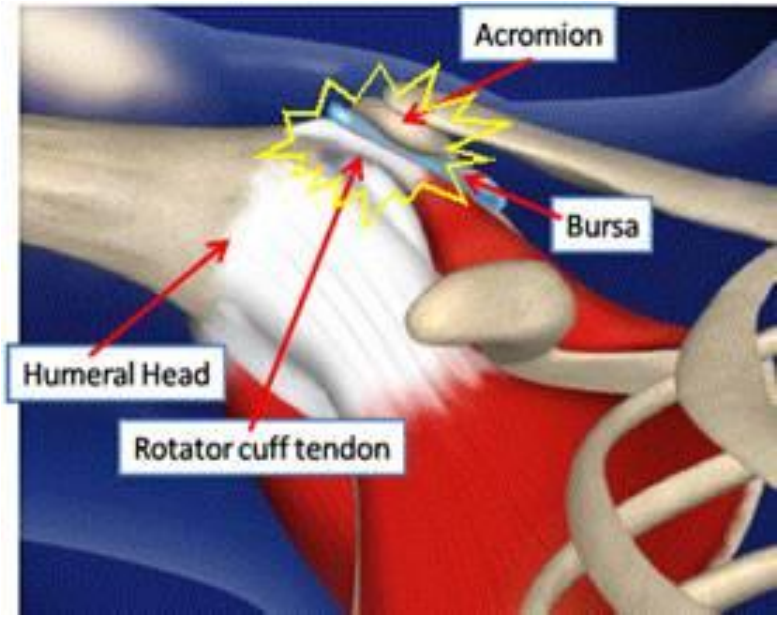
- We will be discussing the atraumatic injuries that develop over time

Rotator Cuff Disorders

Mechanism of injury

- Over chest level use of arm tends to provoke a rub/wear/impingement of the tendons between the humeral head and acromion





Rotator Cuff Disorders

This impingement creates an inflammation of the bursa, and rotator cuff tendon(s).

In addition, an abrasive type wear can degrade, thin or tear the tendon over time

There is a spectrum of severity that can be seen from inflammation to frank tearing

Rotator Cuff Disorders

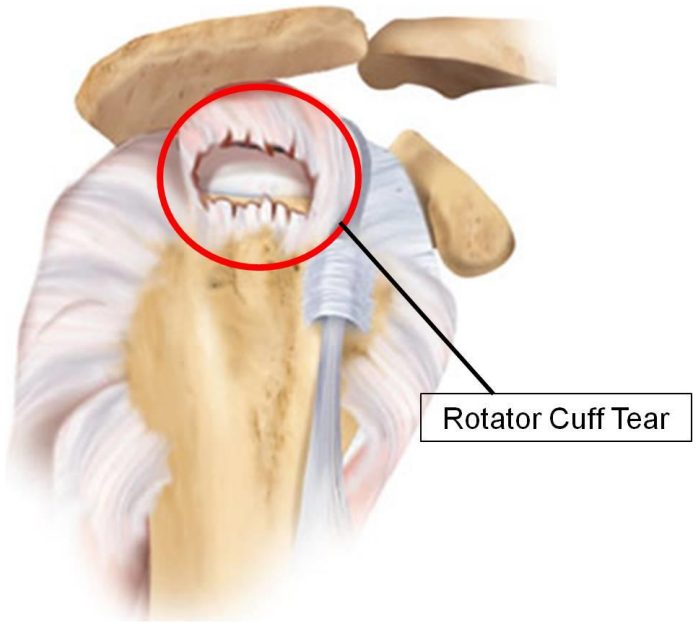
Terms are almost interchangeable

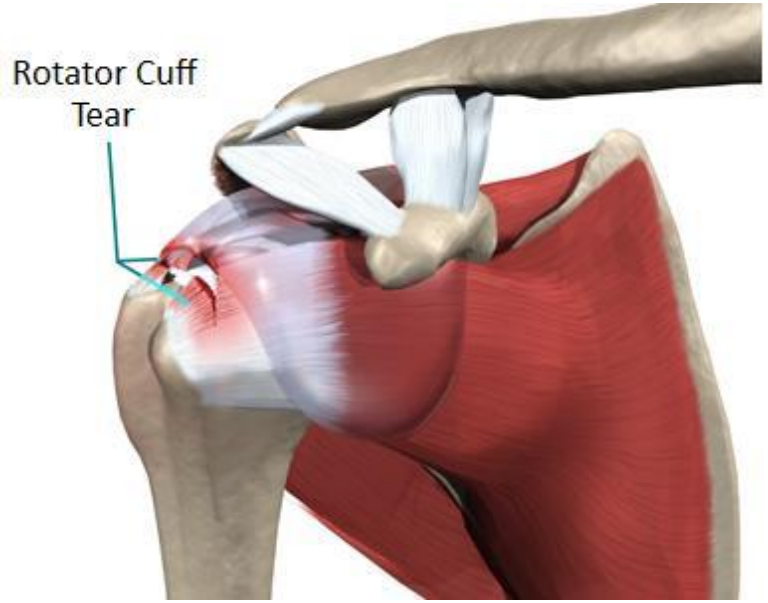
- Shoulder impingement
- Subacromial impingement
- Subacromial bursitis
- Subdeltoid bursitis
- Rotator cuff tendonopathy
- Rotator cuff tendonitis

Rotator Cuff Disorders

Rotator cuff tear

- The ultimate fate of ongoing wear and tear
- Not always symptomatic!!!
- Can be partial thickness or full thickness





Rotator Cuff Disorders

Risk

- AGE AGE AGE AGE AGE
- BMI – increase in BMI increases risk
- Biopsychosocial
- Diabetes
- Anatomical variations

Rotator Cuff Disorders

Risk – Occupational

- Combination
  - Force and posture
  - Force and repetition
- Awkward postures
  - More than 60 degrees of flexion or abduction
  - Overhead work

Rotator Cuff Disorders

Cause may be Idiopathic

- As we age there is a high incidence of rotator cuff disease – wear and/or frank tearing
- Many individuals without specific risk factors (other than age) present with disorders

Rotator Cuff Disorders

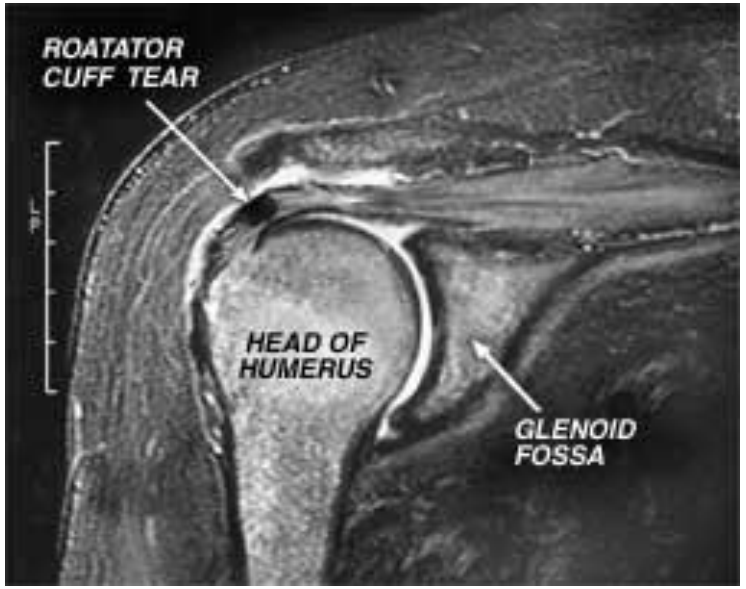
Diagnosis

- Physical exam maneuvers
  - Impingement provocation
  - Rotator cuff strength testing
- Imaging
  - X-rays – show secondary change
  - MRI
  - Ultrasound

Rotator Cuff Disorders

Diagnosis – Imaging

- MRI is the gold standard to show the condition of the rotator cuff, the presence of tendon thinning or tear, bursitis, rubbing of the acromion on the cuff.
- CAUTION: These abnormalities of the rotator cuff are often seen in asymptomatic individuals



Rotator Cuff Disorders

Treatment

- Therapy
- Injections
- Surgery

Rotator Cuff Disorders

Therapy

- Regain range of motion
- Strengthen Rotator Cuff Tendons
  - Self protective
- Calm inflammation

Rotator Cuff Disorders

Injections - corticosteroids

- Inject specific areas to as a test to determine source of symptoms
  - Subacromial space
    - Impingement, bursitis, tendonitis
  - Glenohumeral joint
    - Labral tear
    - Intra-articular pathology
  - Acromioclavicular joint
    - AC joint DJD or Sprain



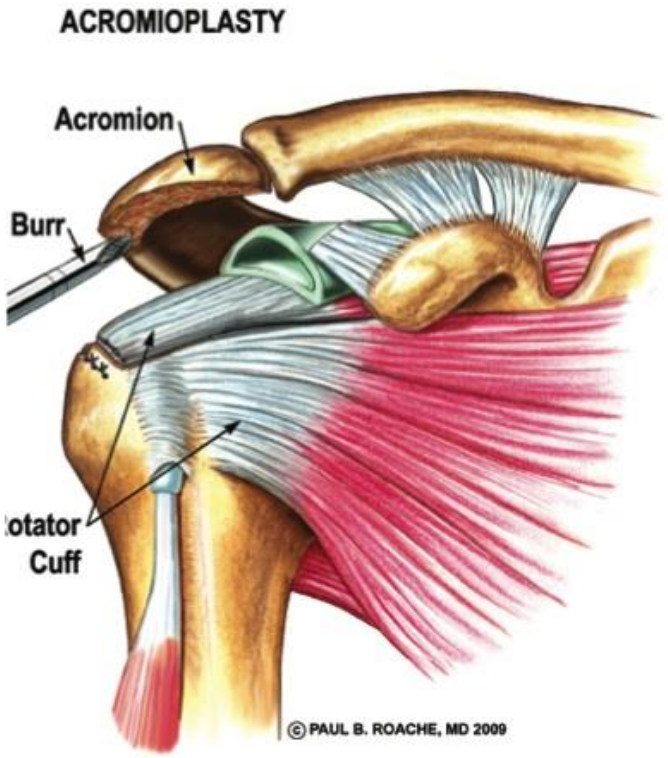
Rotator Cuff Disorders

Surgery

- Arthroscopic evaluation to inspect and confirm MRI findings
- Subacromial decompression to smooth the undersurface of the acromion
- Debride/trim away partial tears or fraying of the rotator cuff
- Repair of frank tears of the rotator cuff

Rotator Cuff Disorders

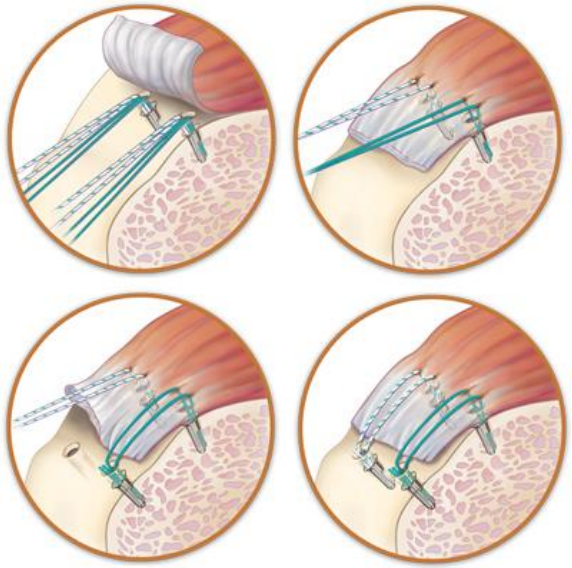
Surgery – Subacromial decompression aka “acromioplasty”

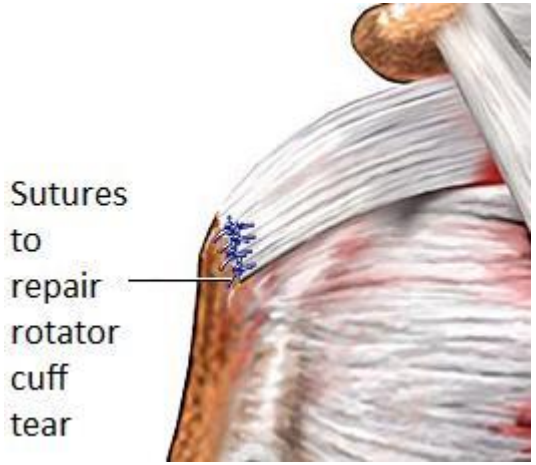


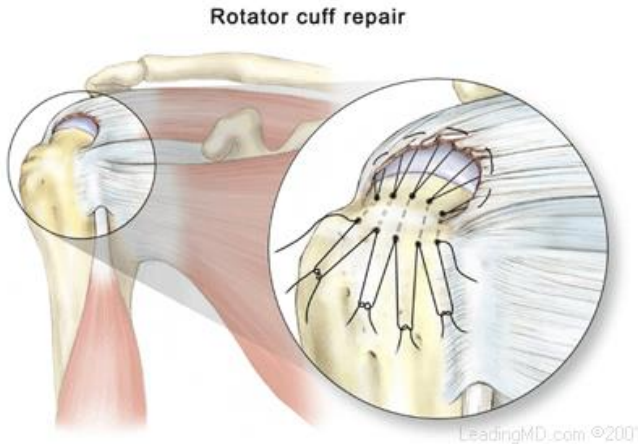


Rotator Cuff Disorders

Rotator cuff repair – open surgery or arthroscopically







Rotator Cuff Disorders

Recovery

- 2-6 months for moderate to heavy activity
- PT usually needed

Rotator Cuff Disorders

Prognosis

- Varies depending on diagnosis
- Significant incidence of residual symptoms
- Significant incidence of re-tear of repairs
- May have long term restrictions of overhead activity

Rotator Cuff Disorders

Common scenario

- Shoulder pain
- Fails to improve with time
- MRI obtained shows a list of lesions
- Orthopaedic Surgery referral
- Surgeon considers all lesions as part of injury and contributors to pain

Rotator Cuff Disorders

Common scenario (continued)

- Shopping list of lesions found
  - Partial/Full thickness rotator cuff tear
  - Subacromial bursitis
  - Impingement
  - Acromioclavicular joint arthritis
  - Labral tears
  - Biceps tendon tears
- All get surgical treatment without really knowing for sure which are symptomatic

Thoughts on Causation

Doctors appear to have an instinct to advocate for patients and will often dig in deep on causation even absent a good argument. They appear to be frequently successful in wearing the system down.

Occupational Medicine specialists appear to be just as guilty despite what would be an expectation of knowing better.

Thoughts on Causation

Examples:

- CTS is usually most symptomatic during sleep. Sleep does not cause CTS.
- If you burn your hand making breakfast and go to work and grab a tool and exclaim “OUCH!”, that does not make that burn compensable.
- Individuals develop degenerative arthritis naturally and progressively, and it is no doubt that work activity could help “demonstrate” the condition

Pearls

Medical Treatment Guidelines

- Published by LNI (Washington)
- Specific for certain conditions or procedures
- For Upper Extremity:
  - Carpal Tunnel Syndrome
  - Shoulder Conditions
  - Cubital Tunnel
- There are also guidelines for advanced imaging (MRI…)

Pearls

Objective findings

- Usually necessary to substantiate
  - Presence of an injury or condition
  - The need for treatment
  - The need for restrictions
- Good concept, but –
  - Not all painful and disabling conditions manifest objective findings

Pearls

Objective findings

- What is a reasonable approach?
  - My approach:
  - Give people the benefit of the doubt
  - Make sure the clinical presentation is physiologic
  - When push comes to shove, use objective findings to shut it down

Pearls

Hand therapy

- Postoperatively often unnecessary in cases like carpal tunnel or trigger finger, however in certain injured workers there is often a need to chaperone the patient through rehabilitation and provide guidance and objective basis for restrictions (or lack thereof)

Attorney Involvement

Poor prognostic indicator



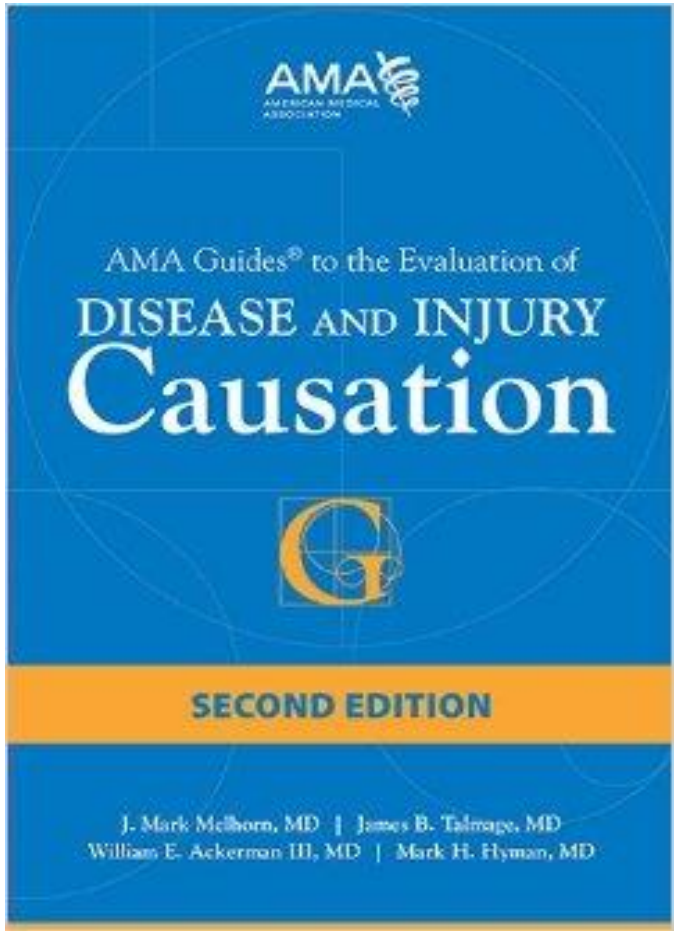
Causation



"All those in favor of calling this a workplace accident ..."

Causation

The “bible” of causation



Causation

Controversial

- Studies are not definitive
- Studies are absent
- Studies are poor quality
- Different studies show different conclusions
- You can find a study to support almost any opinion
- Clinicians are ignorant of real data
- Clinicians are biased and want to help patients naturally

Causation

Controversial

- Occupational exposure is a continuum
  - Are all mechanics jobs the same?
  - Are all carpenters jobs the same?
  - Are all butchers jobs the same?
- Job descriptions are not perfect

Causation

Controversial

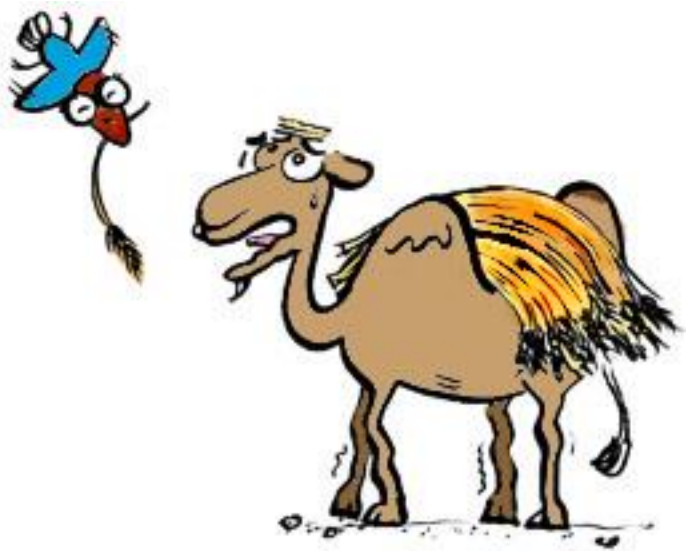
- The law is the farthest thing from science there is (in my humble opinion)
- “Lighting up”, Temporary or Permanent Aggravation is the law
  - Opens up the door for any pre-existing condition to be “bought” by an employer
  - As an employer I find the prospect terrifying

Causation

Controversial

- The straw that breaks the camel's back

The exposure



The claimant before the exposure

- Who pays for the broken camel?

Causation

Controversial

- The ***Zavala*** decision in Washington:
- Even if direct evidence of pre-injury symptoms cannot be found, well-reasoned medical opinions should still be considered to counter unverified assertions of a preexisting condition being “lit up” by an industrial injury.

Causation

Thin skull rule compared to crumbling skull rule

- The injury is deemed “thin skull” when there is a pre-existing condition that is not active or symptomatic at the time of the accident, and that is unlikely to become active but for the accident. If the injury is proven to be of a thin skull nature, then the defendant is liable for all the plaintiff’s injuries resulting from the accident.

Causation

Thin skull rule compared to crumbling skull rule

- A “crumbling skull” injury is also one where there is a pre-existing condition, but one which is active or likely to become active regardless of the accident. If the injury is proven to be of a crumbling skull nature, then the plaintiff is liable only to the extent that the accident caused an aggravation to the pre-existing condition

Medical Literature

Pubmed.com

- National Library of Medicine
- Review the medical literature yourself
- Abstracts often available
- For medical professionals so beware





THANK YOU FOR YOUR ATTENTION!

ANY QUESTIONS?