OREGON HEALTH & SCIENCE UNIVERSITY

OHSU

AAOS

AMERICAN ACADEMY OF ORTHOPAEDIC SURGEONS

2024 Musculoskeletal Galaxy Meeting
Hand and Wrist

Presented by: Omar Nazir, MD

Date: Saturday, June 8th 2024

Disclosures

- None

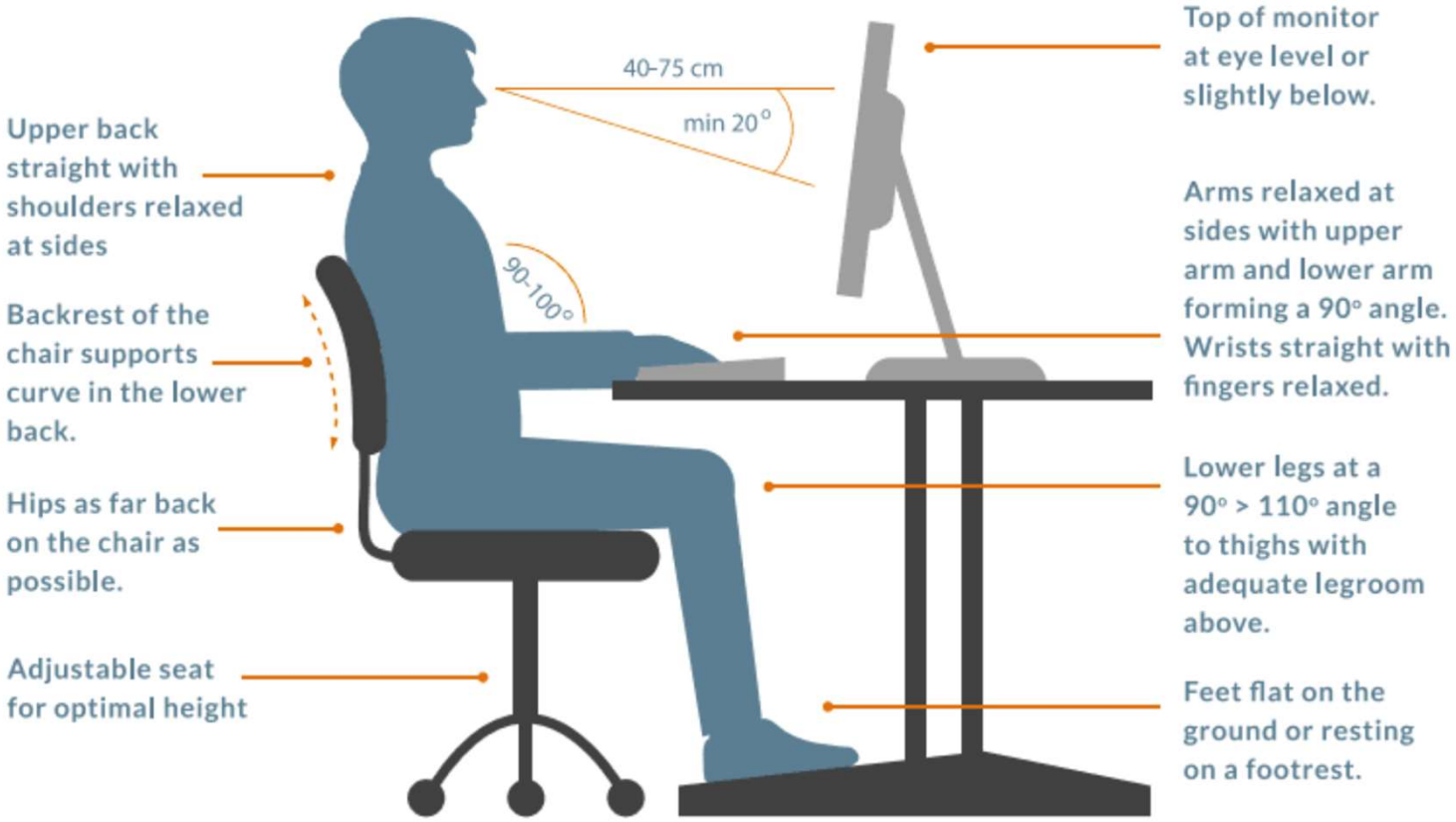
OREGON HEALTH & SCIENCE UNIVERSITY

Agenda

- Ergonomics
- Anatomy and Physical Exam
- Imaging
- Common Conditions

OREGON HEALTH & SCIENCE UNIVERSITY

Practice



OREGON HEALTH & SCIENCE UNIVERSITY

Formulating Diagnosis

- Diagnose and treat
- Ulnar or radial wrist?
- Anatomic level
  - Distal forearm, radiocarpal joint, proximal carpal row…
- Anatomic layer
  - Skin, subcutaneous, neurovascular, tendon, bone, joint…

OREGON HEALTH & SCIENCE UNIVERSITY

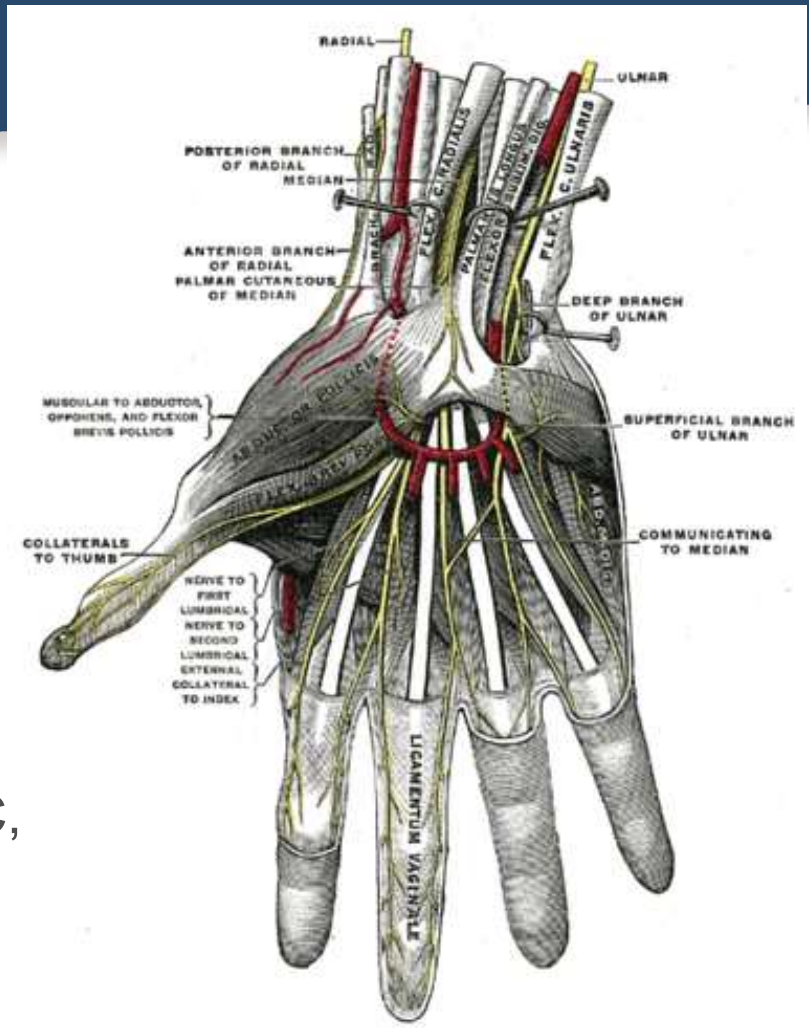
Wrist Examination

- *Flexion/extension*
- *Radial/ulnar deviation*
- *Pronation/supination*

OREGON HEALTH SCIENCE UNIVERSITY
OHSU

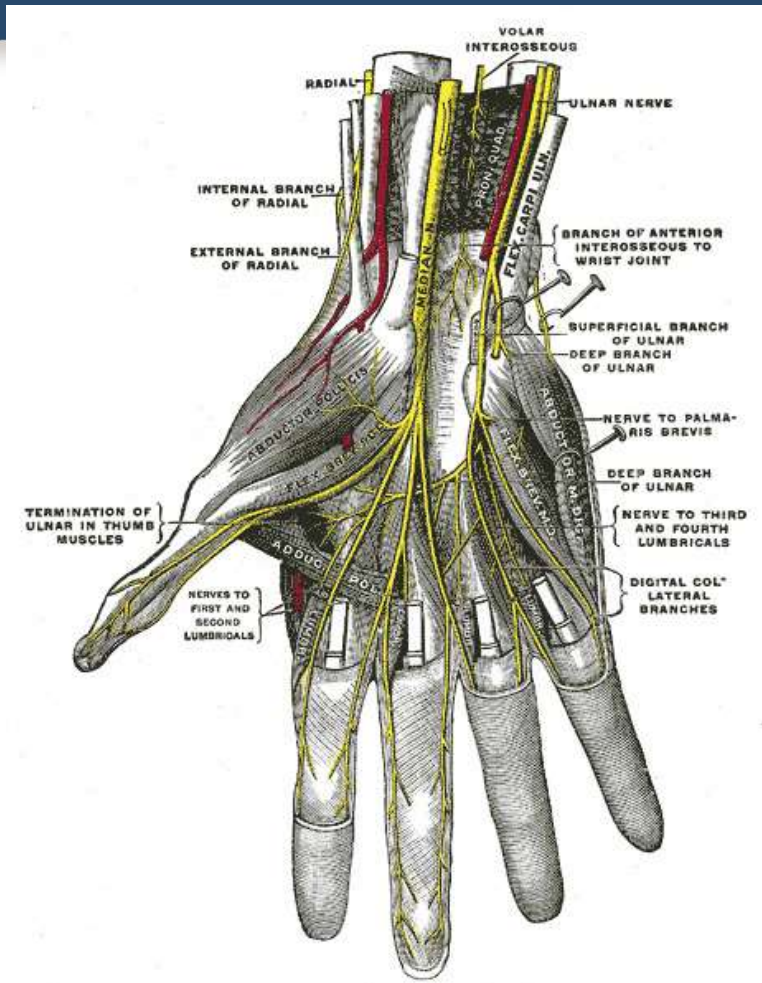
Detailed Hand Examination

- Inspect
  - Swelling, Erythema, Color, Wounds, Muscle Wasting, Vascularity
- Observe
  - Active range of motion
  - Cascade of the fingers
- Motor Examination
  - Flexors: FPL, each FDS and FDP, FCU, FCR
  - Extensors: EPB, EPL, ECRL, ECRB, each EDC, EIP, EDM, ECU
  - Thenar Muscles: APB, OP, FPB, AdP
  - Hypothenar Muscles: ADM, FDM, ODM
  - Interosseous Muscles



Detailed Hand Examination

- Sensation
  - Obtain baseline nerve examination before local anesthetic is given
  - Static 2-Point Discrimination
    - Ulnar and radial digital nerves
  - Ulnar Nerve
    - Small finger and ulnar half of ring finger
  - Median Nerve
    - Volar surface of thumb, Index and Long fingers, radial half of ring finger
    - Anterior Interosseous Nerve to volar wrist capsule
  - Radial Nerve
    - Radial ¾ dorsum of hand, dorsum of thumb
    - Posterior Interosseous Nerve to dorsal wrist capsule
- Palpate
  - *Pulses/Allen's Test*
  - Bony tenderness (ie over Snuffbox)
  - Load or stress joints



Rapid Hand Exam

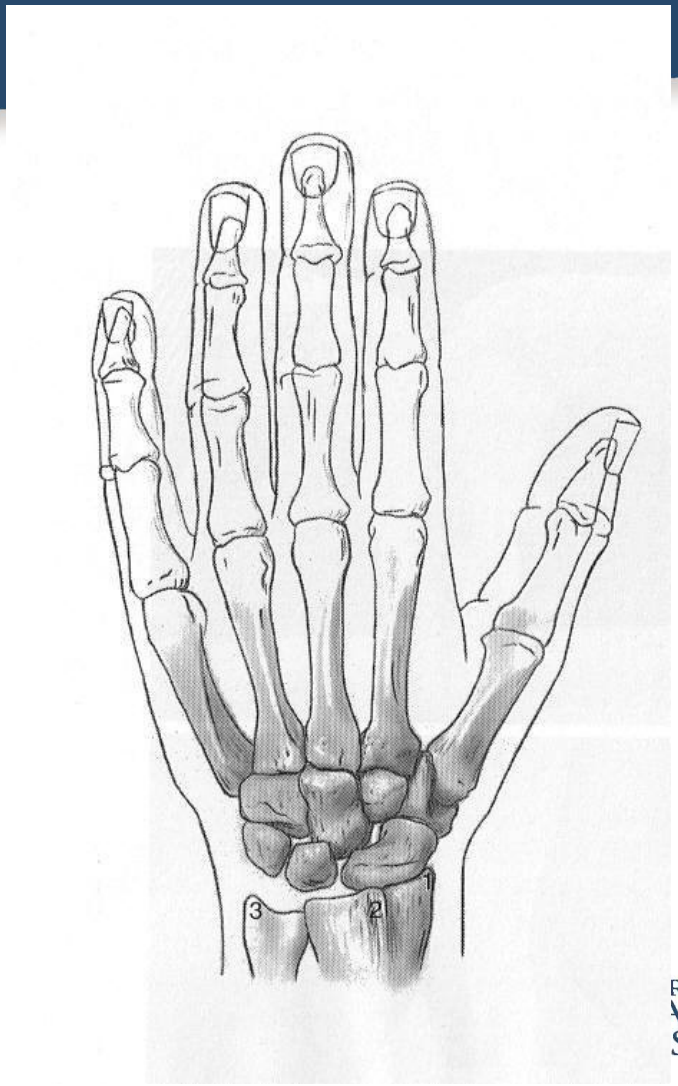
- Inspection
- Finger spread
  - Ulnar nerve
- A- OK
  - AIN (branch of median nerve)
- Point and Shoot
  - PIN (branch of radial nerve)
- Cross fingers
  - Ulnar nerve
- Flexion/extension
  - 80/80
- Supination/pronation
  - 80/80
- 2 point discrimination

OREGON HEALTH & SCIENCE UNIVERSITY

OREGON HEALTH & SCIENCE UNIVERSITY

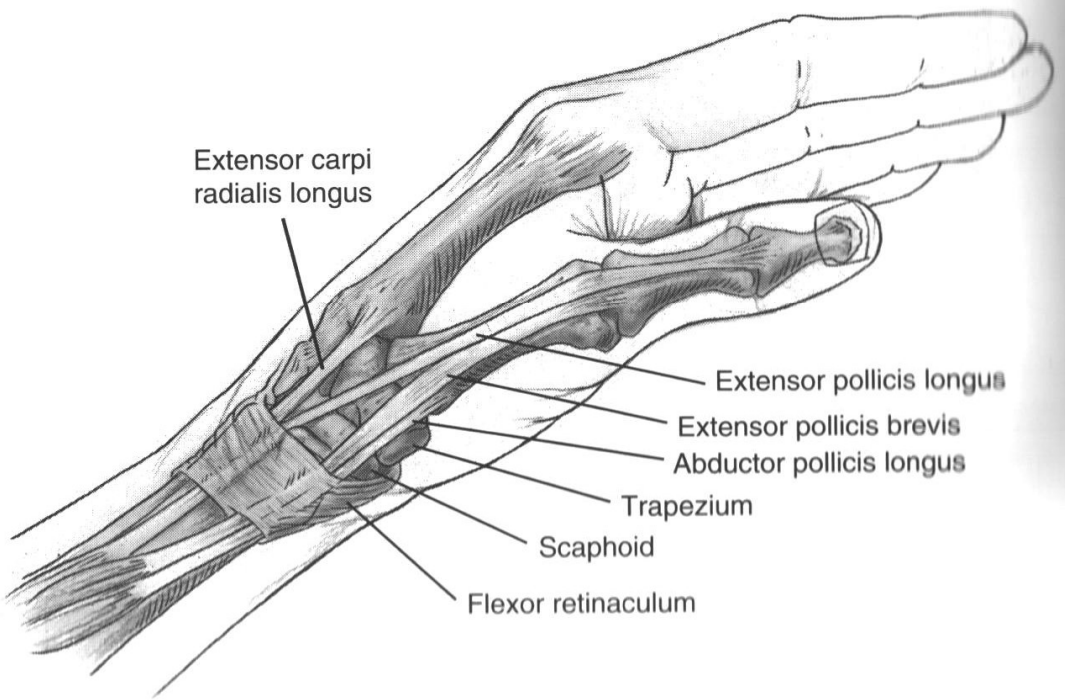
Dorsal Wrist

- Prominent Landmarks
  - Radial styloid
  - Lister's tubercle
  - Ulnar styloid
  - Base of 2nd and 3rd metacarpals



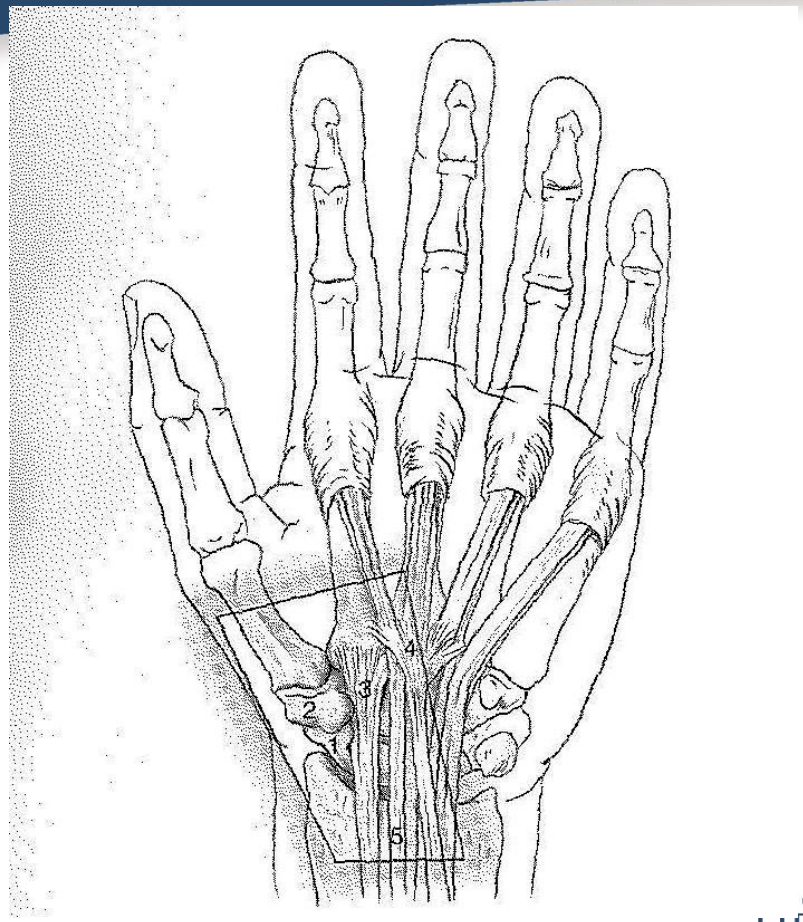
Dorsal Radial Wrist

- Bones
  - Radial styloid, trapezium, base of the 1st metacarpal
- Joints
  - Scaphotrapezial, 1st CMC
- Soft Tissue
  - Tendons of 1st, 2nd, and 3rd compartments
    - APL+EPB, EPL, ECRL



Radial Volar Zone

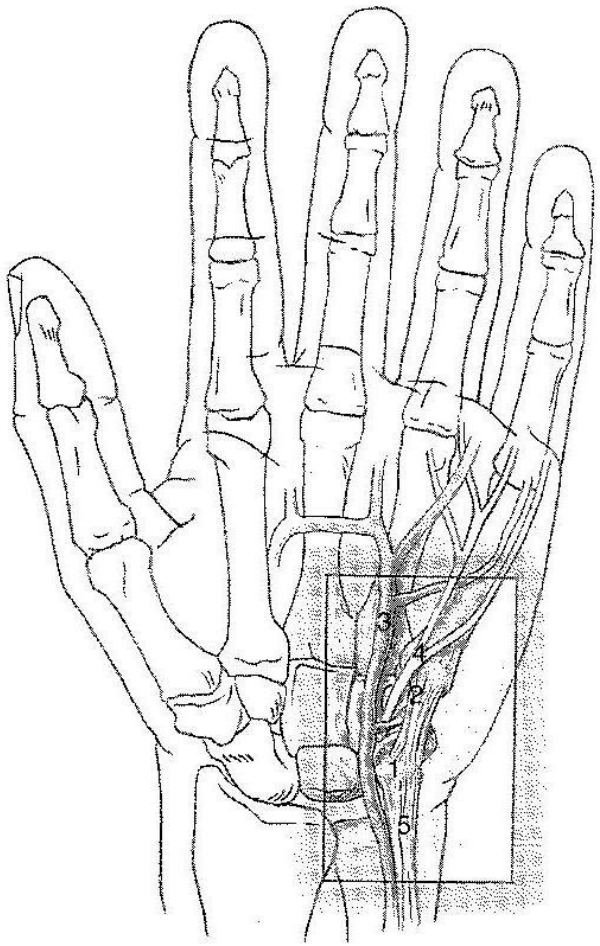
- Bones
  - Scaphoid tuberosity, tubercle of trapezium
- Tendons
  - FCR, Palmaris longus, Long finger flexors
- Nerve
  - Median nerve



OREGON HEALTH & SCIENCE UNIVERSITY

Ulnar Volar Zone

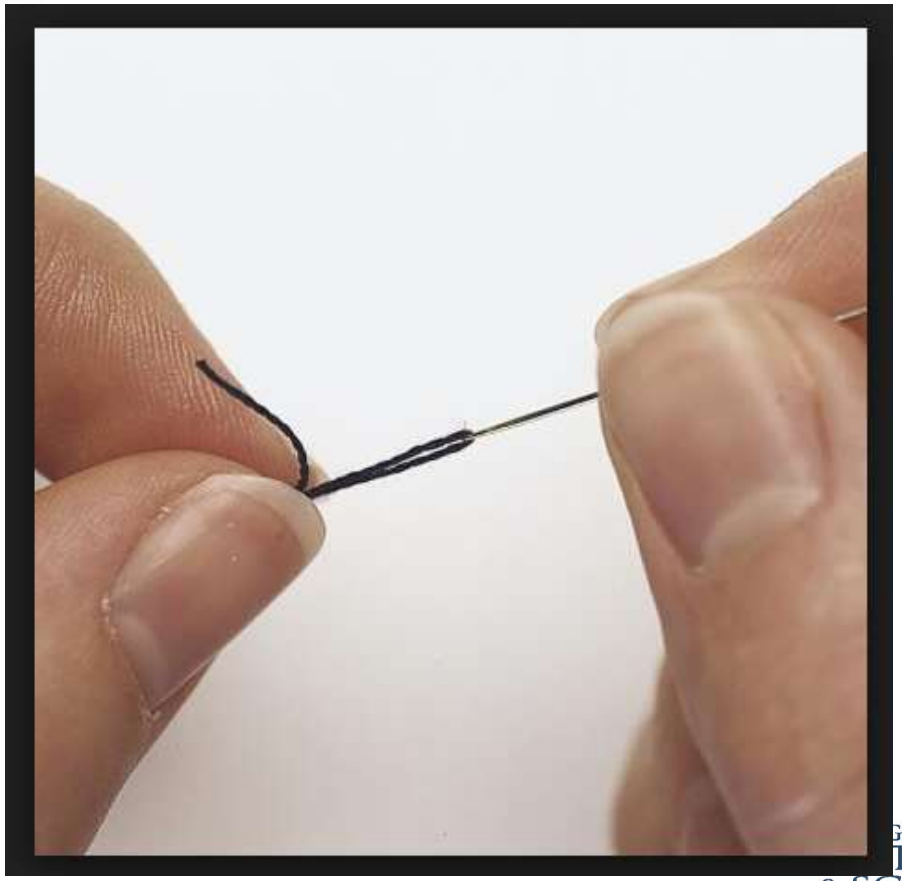
- Bones
  - Pisiform, Hook of hamate
- Tendons
  - FCU
- Artery & Nerve
  - Ulnar



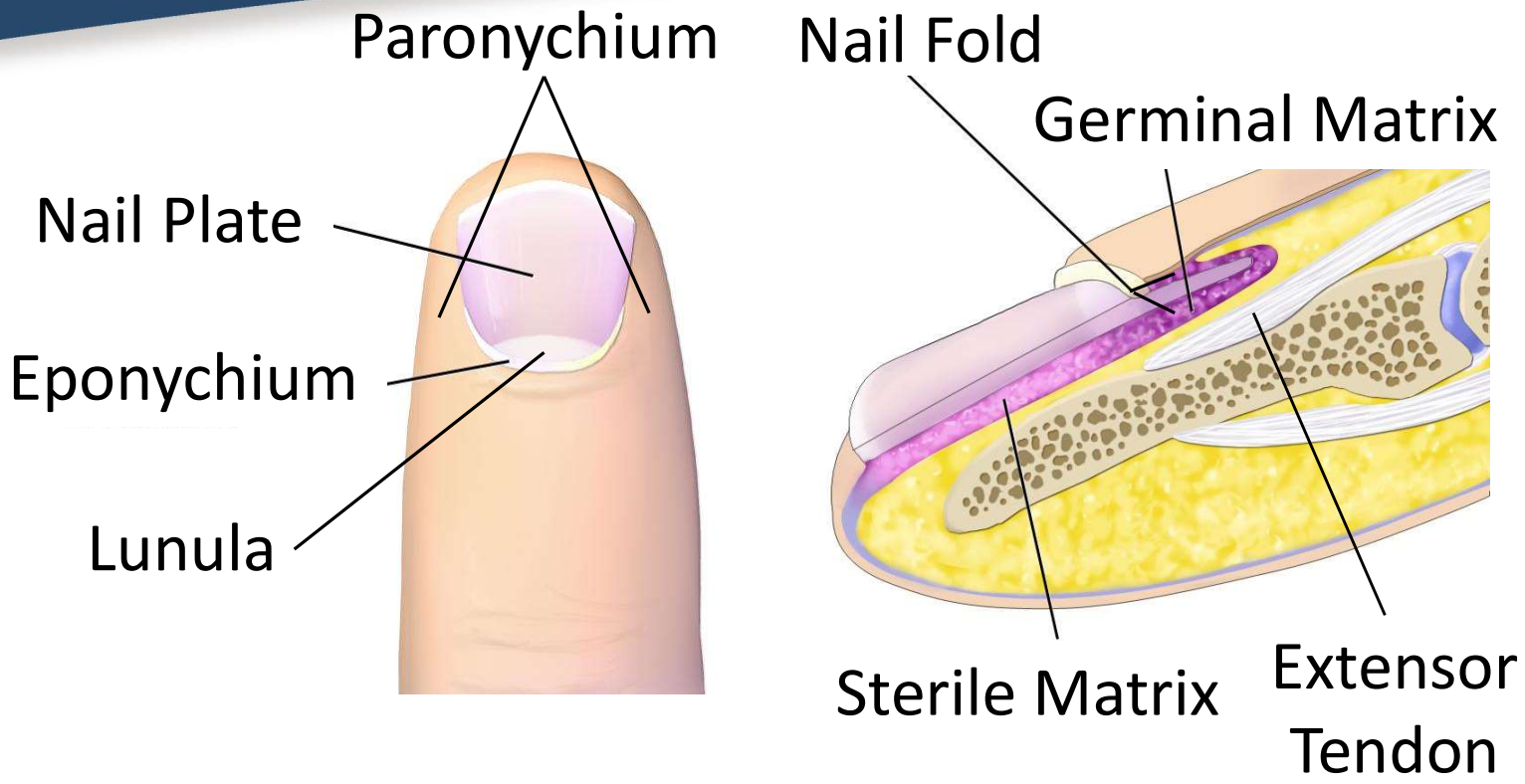
OREGON HEALTH & SCIENCE UNIVERSITY

Nail Function

- Protection
- Sensory perception
- Assist motor function
- Stabilize pulp for forceful pinch



Nail Anatomy

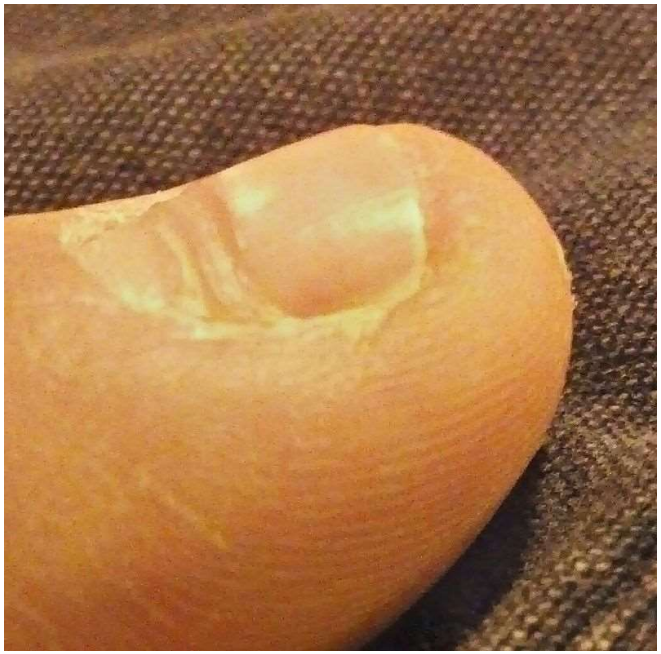


Blausen.com staff. "Blausen gallery 2014". *Wikiversity Journal of Medicine*, with edits

OREGON HEALTH & SCIENCE UNIVERSITY

Nail Physiology

- Grows about ~3mm per month
  - Full nail regrowth up to 6 months
  - Transverse lines akin to growth rings
    - Occur with changes in health, circulation



After a paronychia

OREGON HEALTH & SCIENCE UNIVERSITY

Imaging Techniques Considerations

- Specific for symptoms- no shotgun approach
- Abnormal findings

  -how do they relate to symptoms?
- Limits of techniques

  -Negative study, *test not sensitive?*

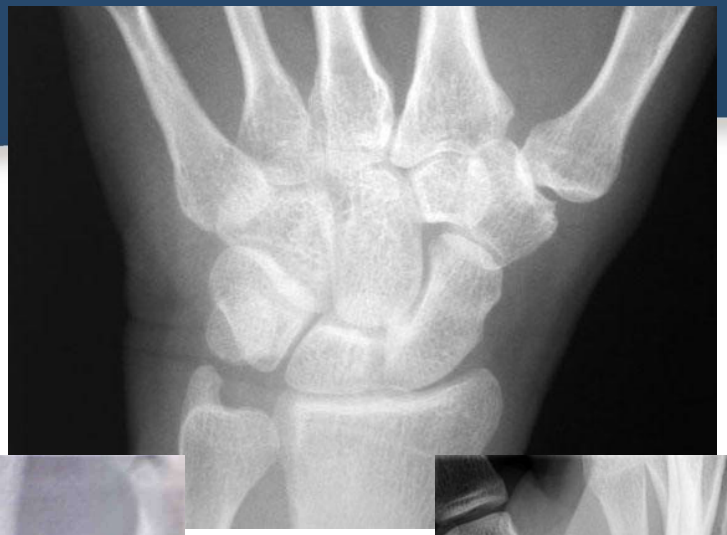
  -Positive study, *not be specific to diagnosis*?
- Effect of cumulative radiation

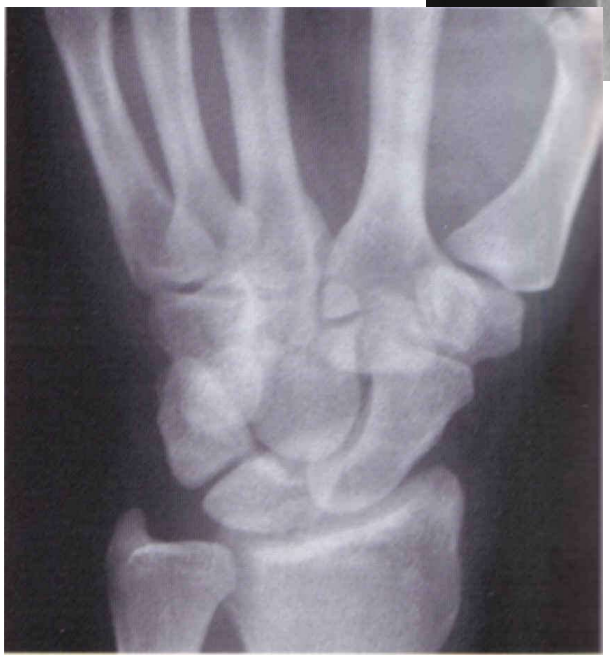
OREGON HEALTH & SCIENCE UNIVERSITY

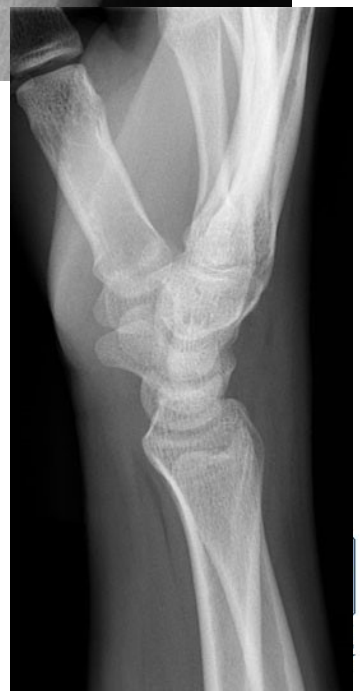
Standard Static Radiographs

Minimum accepted views necessary for X-ray study: 3 projections

- Posteroanterior (PA)
- Lateral
- Oblique

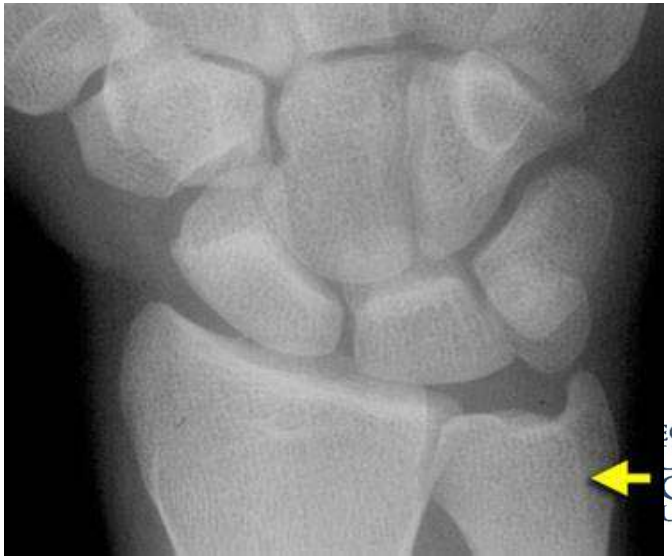






Posteroanterior (PA) Frontal View

- Taken when the elbow is flexed & abducted, palm flat
- Intercarpal articulations – seen as uniform spaces of 1-2 mm
  - Scapholunate space may be a little wider
- A correctly positioned PA view will show the extensor carpi ulnaris groove radial to the midportion of the ulnar styloid.
- Joint between trapezium and trapezoid is not well visualized
  - Better visualized in the oblique view

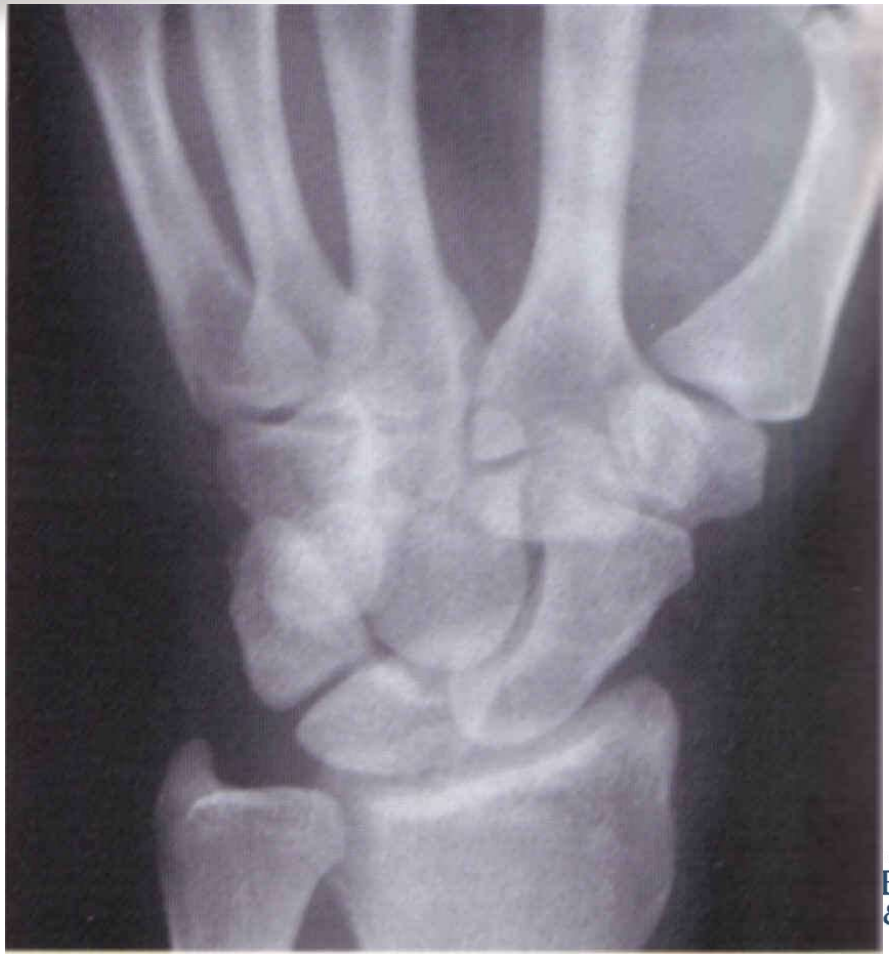


Posteroanterior Oblique View

- Trapezium and trapezoid are not overlapped
- The articulation of these two carpals is projected clearly
- Dorsal surface of triquetrum is seen almost in profile
- Wrist 45 degree semi-pronated

Profiles:

- 1st CMC joint
- STT joint
- Trapeziotrapezoidal joint



Lateral View

- View must be obtained with the forearm in neutral position without pronation or supination
- Easy way to determine the correctness of positioning on the lateral
  - Overlap of scaphoid and pisiform
  - Pisiform's anterior margin should project half way between the anterior margin of the scaphoid and the lunate
- This view is critical for the evaluation of carpal alignment, evaluation of the alignment of the DRUJ, and for assessment of the palmar tilt of the distal radius

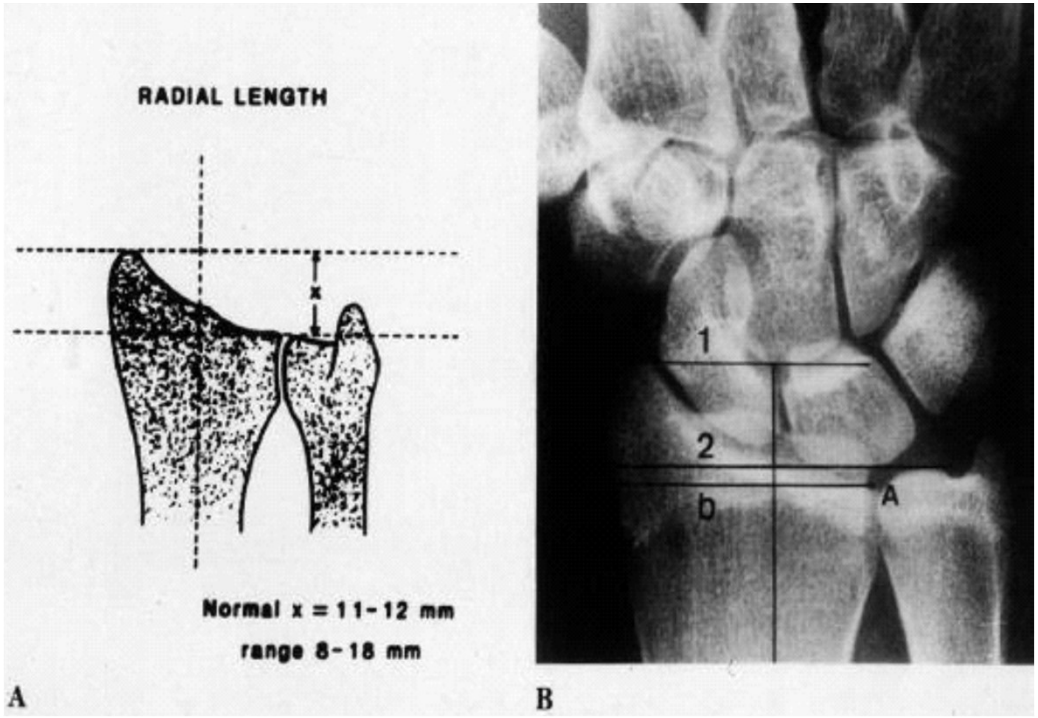
Standard Wrist Measurements

Radial Length

- Normal 11-12 mm
- Range 8-18mm

Ulnar Variance

- Variations -3mm
- Arm extended straight radius shortens



OREGON HEALTH & SCIENCE UNIVERSITY

Standard Wrist Measurements

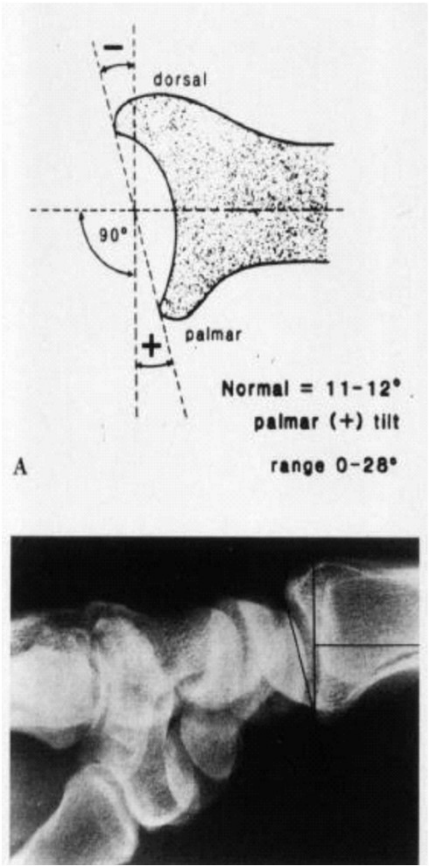
Palmar Tilt

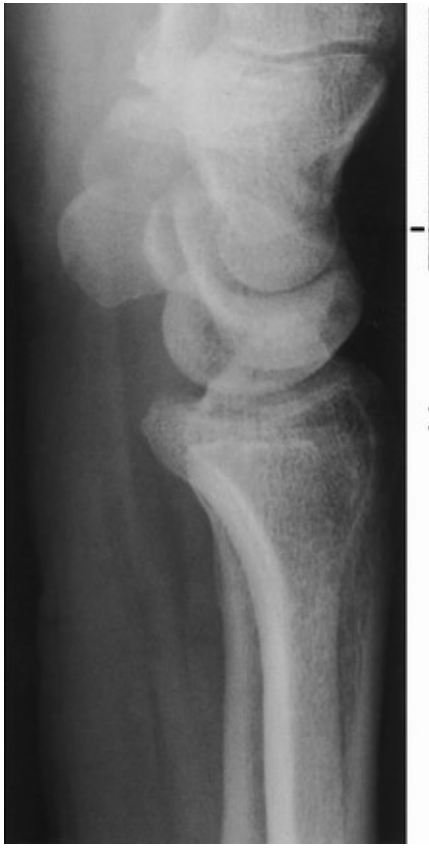
Normal 11-12°

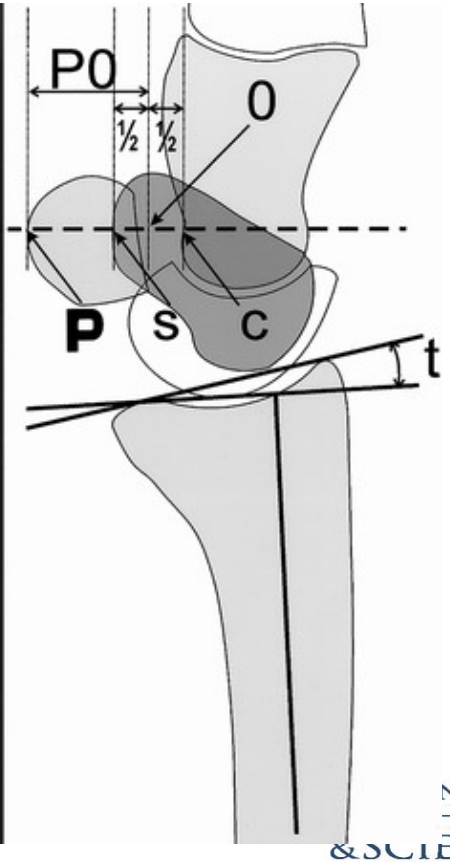
Palmar + tilt

Range 0-28°

- A major factor in treatment decision making of distal radius fractures
- Supination increases palmar tilt





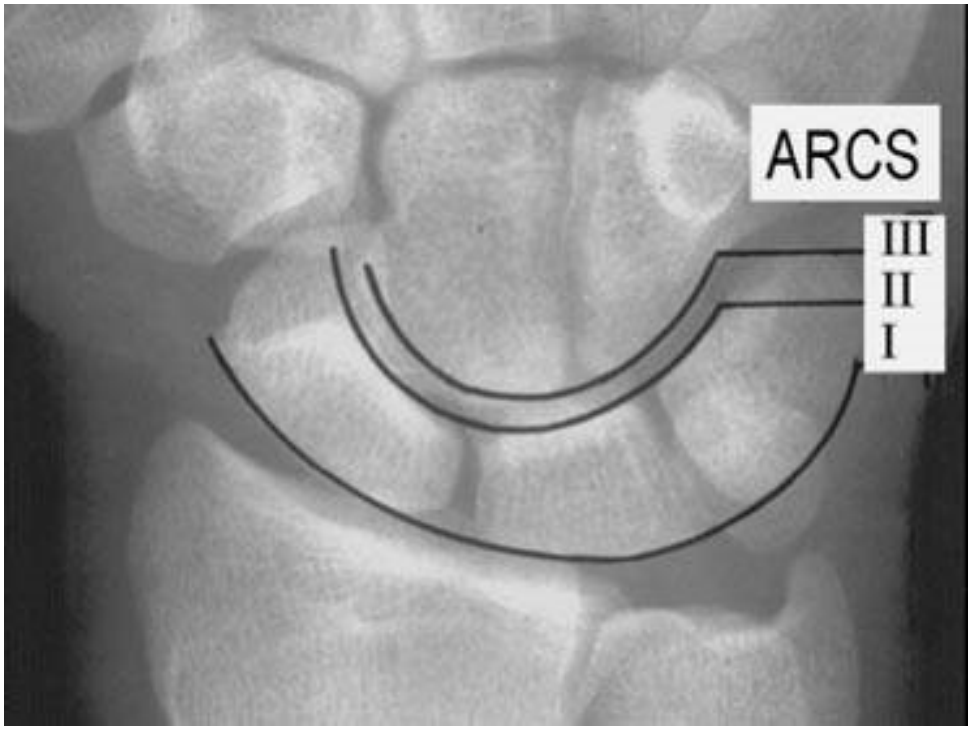


OHSU & SCIENCE UNIVERSITY

Parallelism

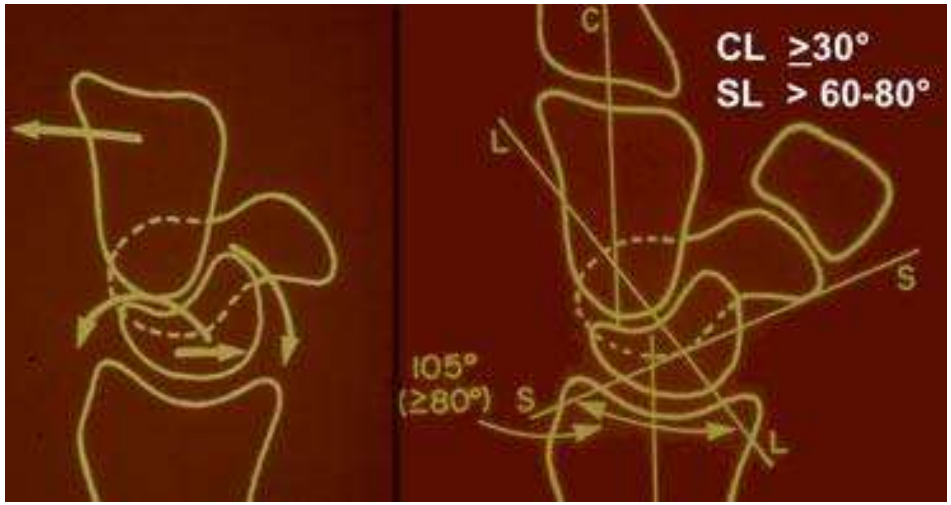
- Opposing articular surfaces or Gilula's lines
- Three Arcs I, II, III
- Distal radius, proximal & distal carpal row
- Pathology: abnormal overlapping of articular surface suggests fractures and/or dislocations of the wrist

  -evaluate CMC & MCP joints
- Radial & Ulnar deviation disrupts the arcs



OREGON HEALTH & SCIENCE UNIVERSITY

DISI vs. VISI



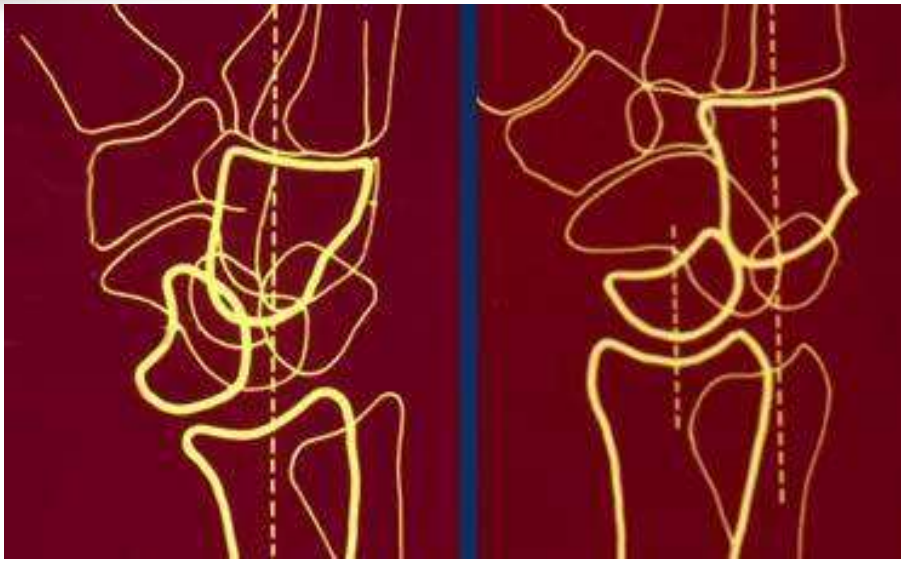
LEFT: Dorsal tilting of the lunate in DISI
RIGHT: Scapholunate angle is > 80˚

LEFT: Volar tilting of the lunate in VISI
RIGHT: Scapholunate angle is < 30˚

OREGON HEALTH & SCIENCE UNIVERSITY

Lunate vs Perilunate Dislocation

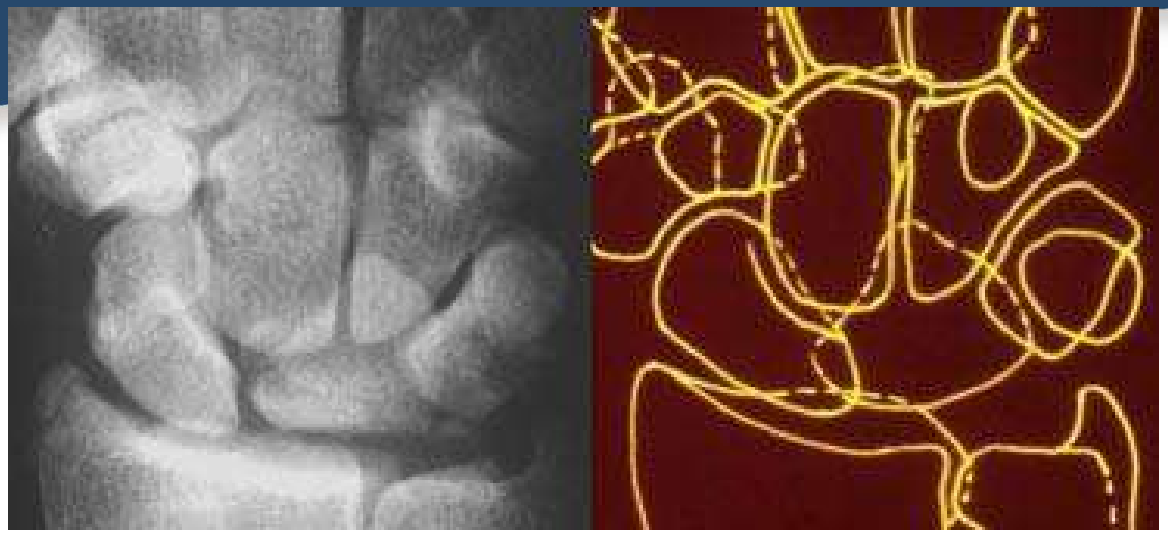
- The key to differentiation between both is what is centered over the radius.
- If the capitate is centered over the radius and the lunate is tilted out, it is a lunate dislocation.
- If however the lunate centers over the distal radius and the capitate is dorsal, we are dealing with a perilunate dislocation



LEFT: Lunate dislocation: capitate is centered over the radius and lunate is tilted out.
RIGHT: Perilunate dislocation: lunate is centered over the radius and capitate is tilted out dorsally.

OREGON HEALTH & SCIENCE UNIVERSITY

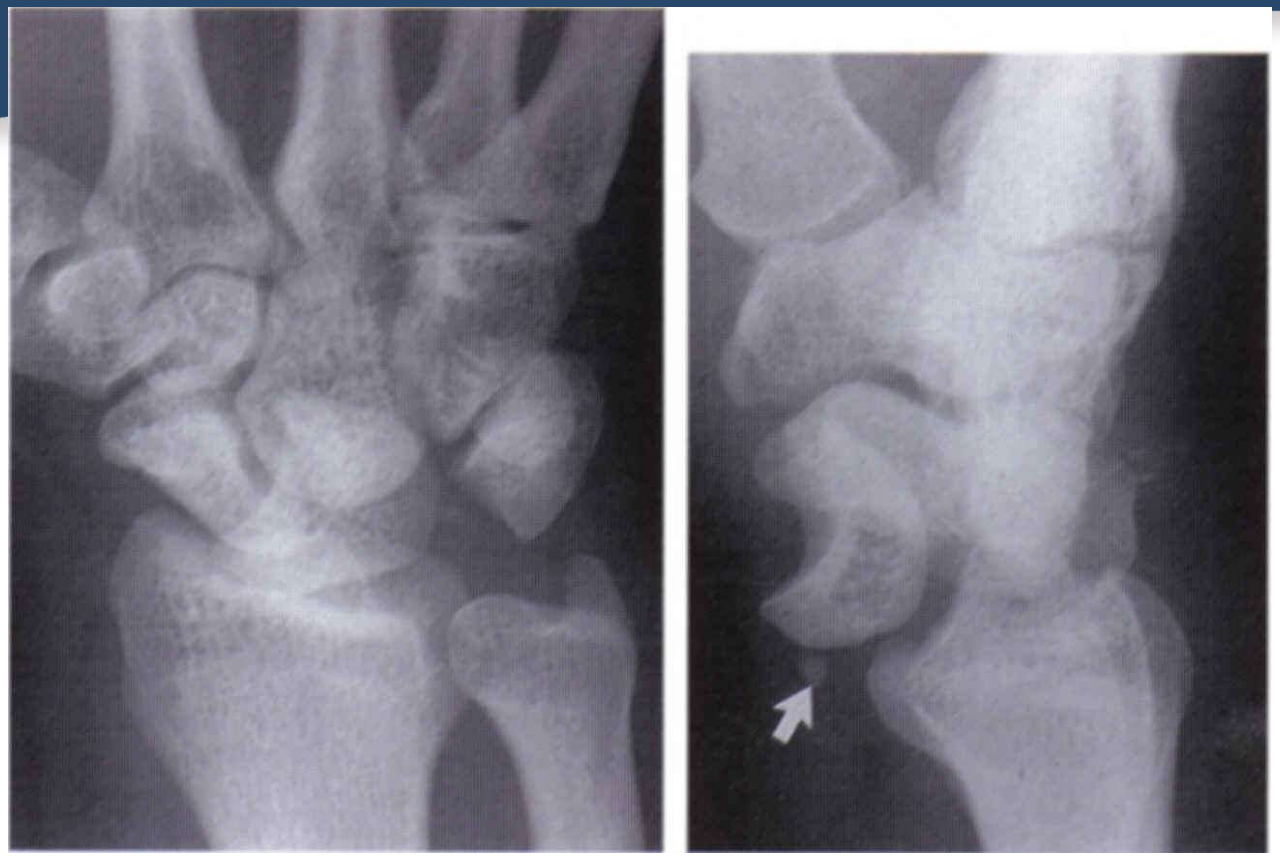
Anterior Lunate Dislocation



- Presence of abnormal overlapping of the lunate with the capitate, hamate and triquetrum
- Presence of abnormal widening of the radiolunate space
- The other joints are nicely parallel and symmetric
- Conclusion: lunate is displaced while the other bones have stayed together

OREGON HEALTH & SCIENCE UNIVERSITY

Anterior Lunate Dislocation

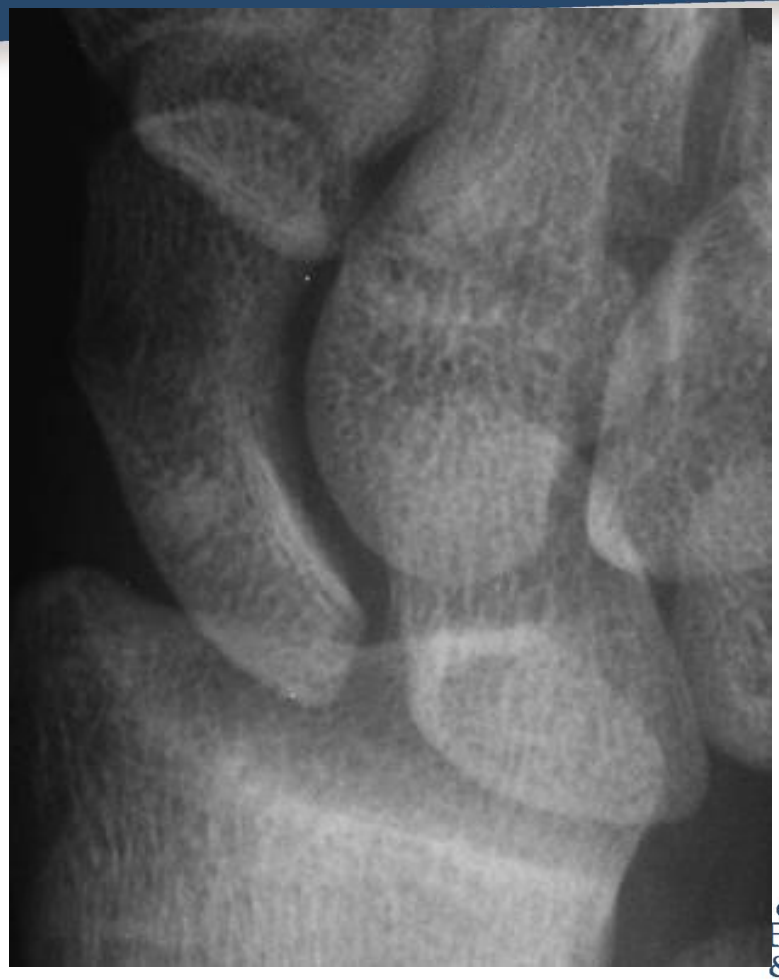


- PA - lunate is dilocated and no longer articulates with adjacent bones
- Lateral – lunate is dislocated and rotated 90 degrees

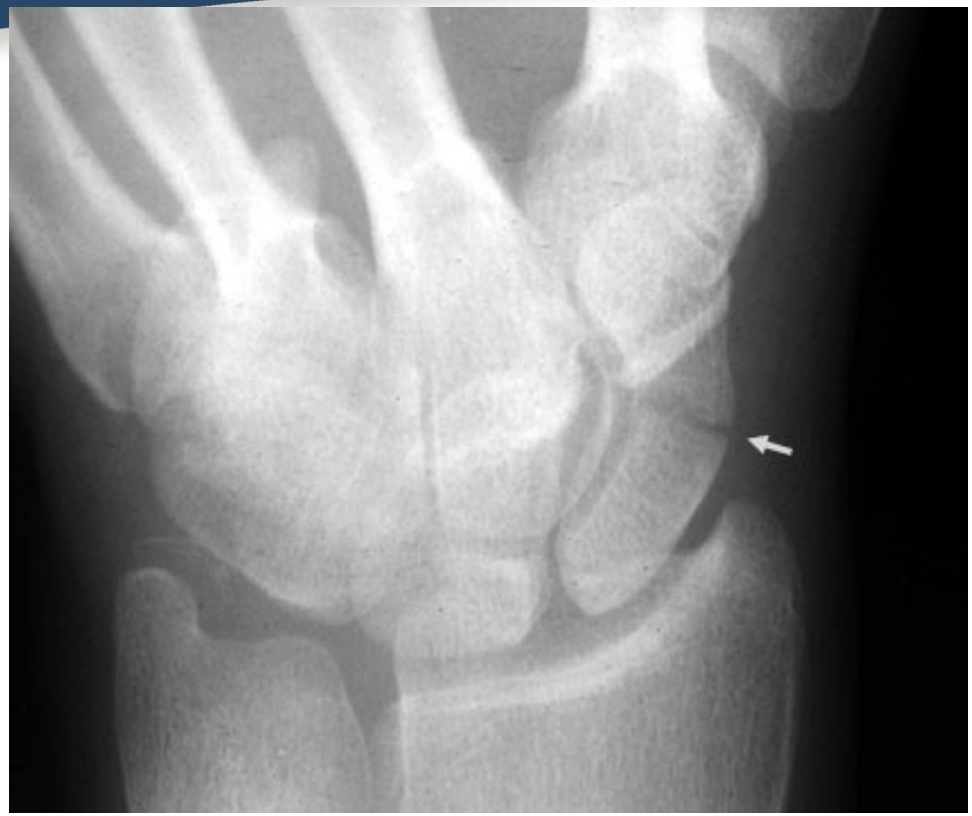
OREGON HEALTH & SCIENCE UNIVERSITY

Special Views: Scaphoid View

- This is a PA with maximum ulnar deviation
- Necessary for all patients who have radial sided wrist pain post trauma
- Scaphoid appears elongated
- Allows visualization of cortex and trabeculae of its waist



Special Views: Scaphoid View



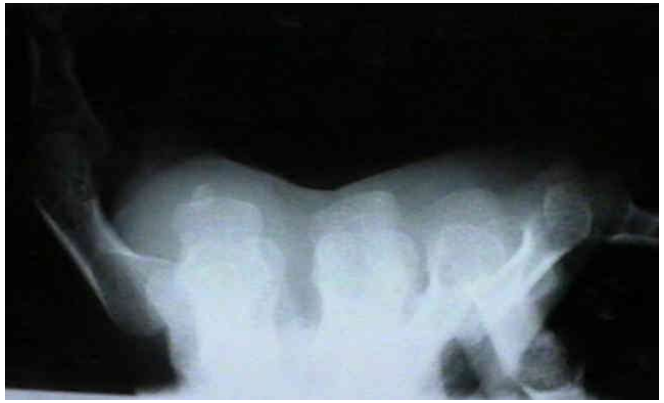
- Waist fracture of scaphoid

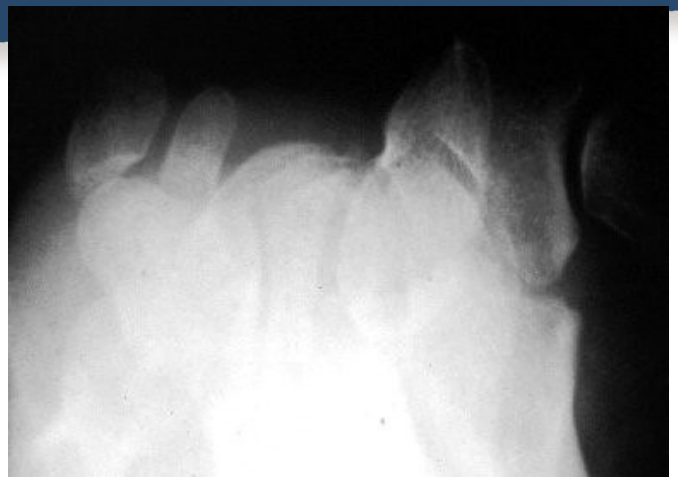
OREGON HEALTH & SCIENCE UNIVERSITY

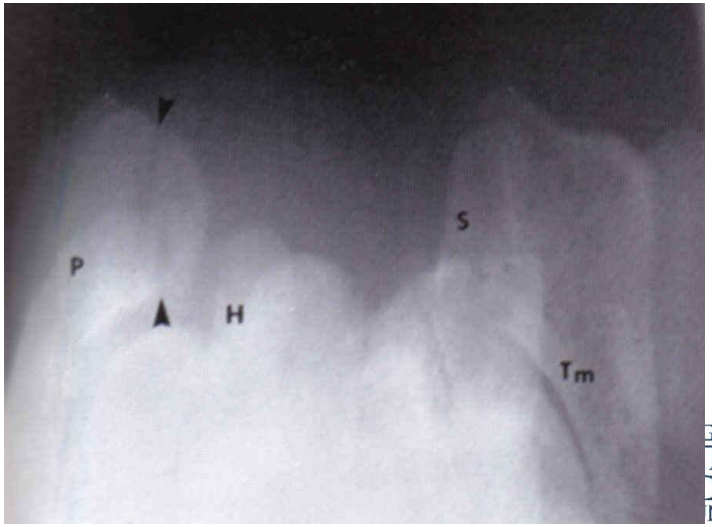
Special Views: Carpal Tunnel View

- Images an axial view of the carpal canal with particular attention to:

- **Hook of the hamate**
- **Pisiform bone**
- **Tubercle of trapezium**

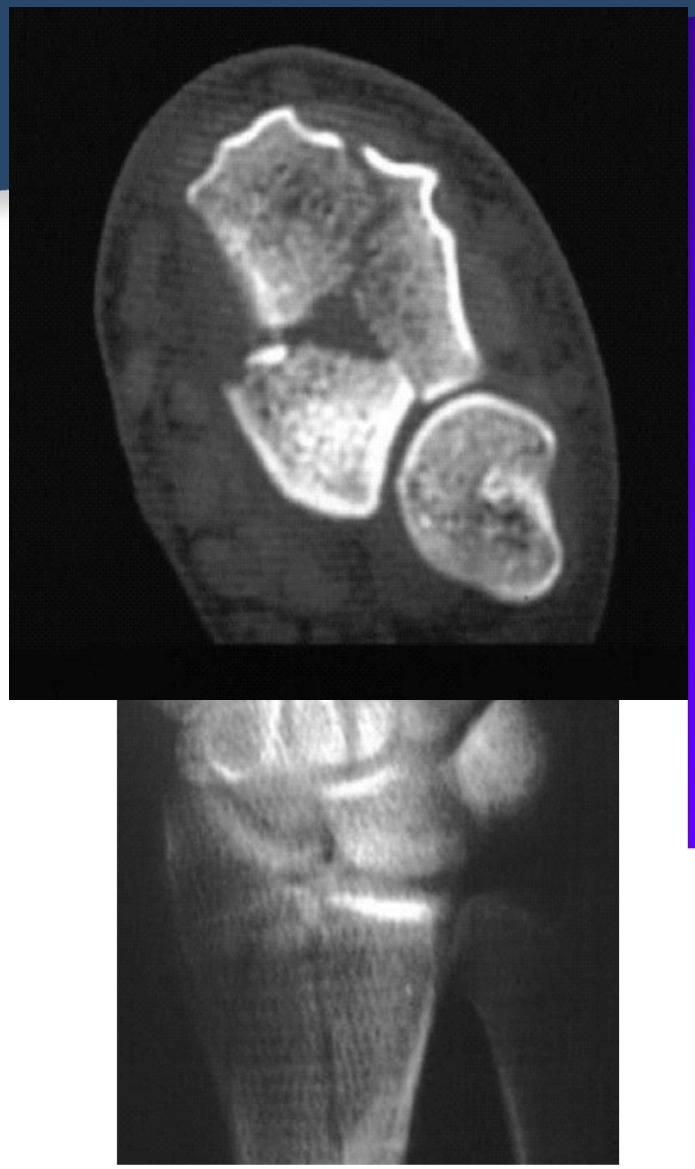






CT-Scan

- Target tissues enhanced
- Serial images
- Limitations from artifacts (such as metals)
- Carpal bones-2mm thickness



Indications

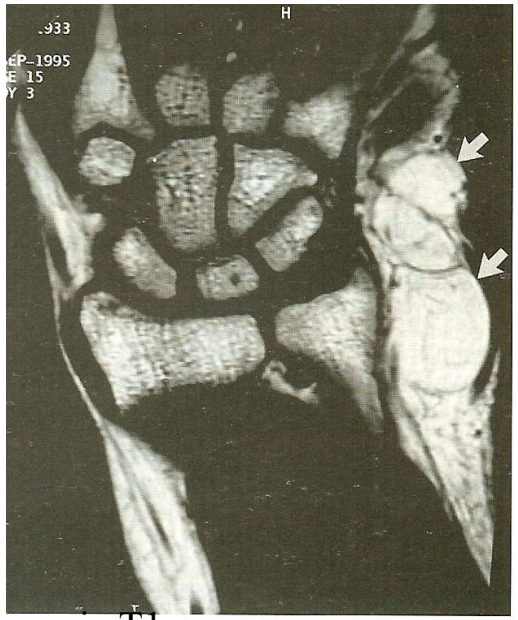
- Trauma
- Joint Congruency
- Degenerative Joint Disease
- Mechanical Pain
- AVN
- Infection
- Tumors

OREGON HEALTH & SCIENCE UNIVERSITY

MRI

- MRI has become increasingly useful in defining subtle injuries of the hand and wrist
- No radiation
- Use of radiofrequency pulses on tissues in a magnetic field
- Relaxation time of atoms to return to normal spin

- T1-short-weighted to fat
- T2-long-weighted to water
- T1 best for normal anatomy
- T2 show contrast of abnormal tissue

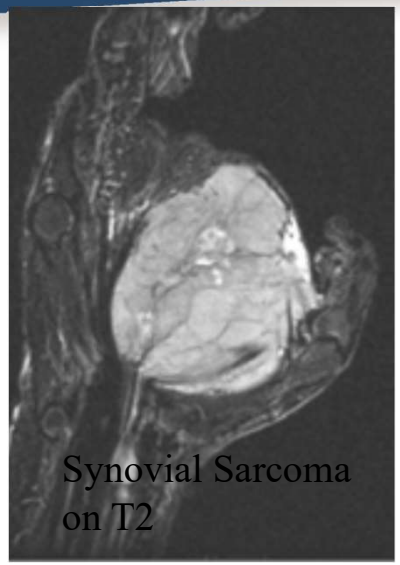


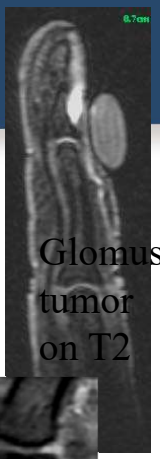
Lipoma in T1 image

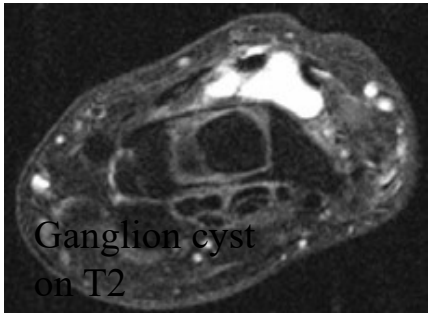
OREGON HEALTH & SCIENCE UNIVERSITY

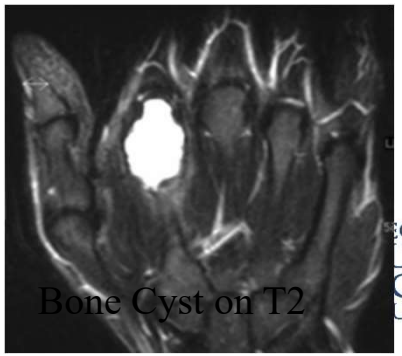
Magnetic Resonance Imaging

- Occult fracture
- Ganglion cyst
- Tumor
- Ligament tear
- Avascular necrosis
- Arthritis
- Tendon pathology
- Nerve impingement









MRI Protocol

Routine MRI wrist:

- Tendon pathology
- Carpal tunnel syndrome
- Ganglion cyst
- Acute trauma
- Osteoarthritis
- AVN

MR arthrogram:

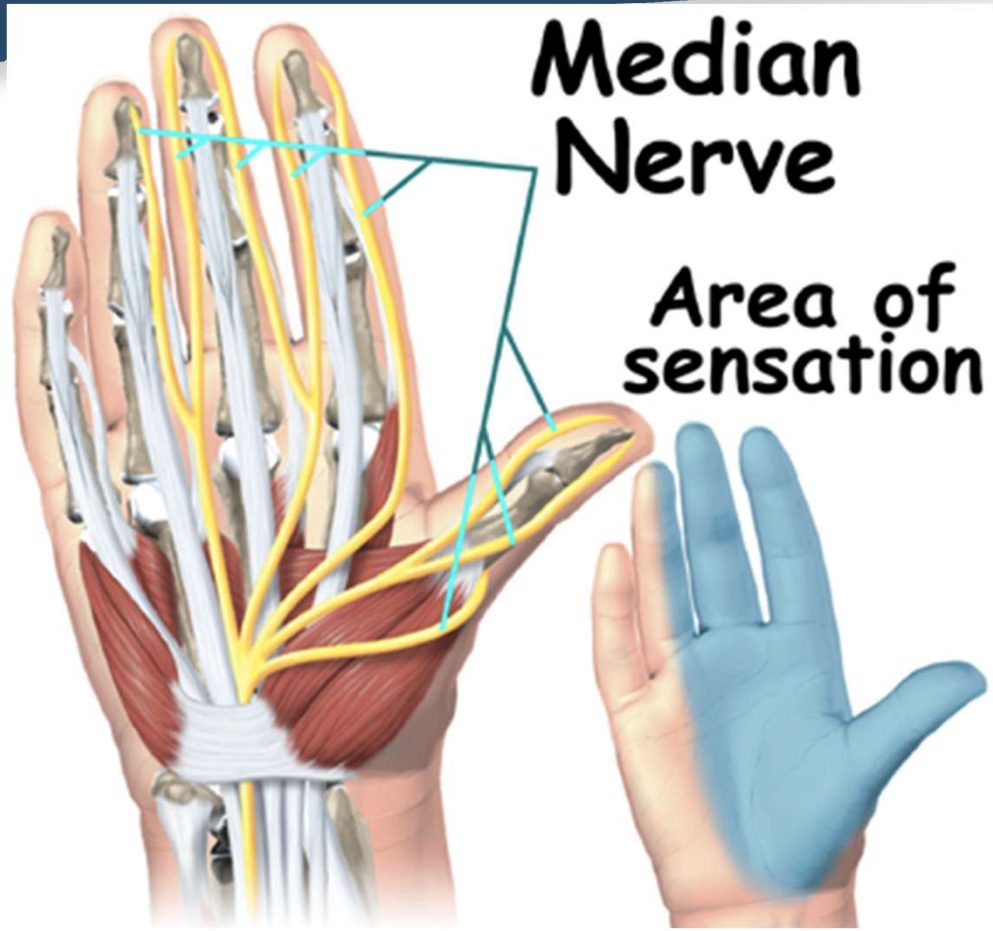
- Ligament tear

MRI wrist with IV contrast:

- Mass
- Infection
- Inflammatory arthropathy

OREGON HEALTH & SCIENCE UNIVERSITY

Carpal Tunnel Syndrome



OREGON HEALTH & SCIENCE UNIVERSITY

Carpal Tunnel Syndrome

- Epidemiology
  - Classically
    - Posttraumatic
    - Female
    - Middle age
  - More recently
    - Younger
    - Industrial worker
    - Repetitive motions
    - Not computer use

OREGON HEALTH & SCIENCE UNIVERSITY

Risk Factors

- Clear intrinsic risk factors
  - Female
  - Pregnancy
  - Diabetes
  - Rheumatoid arthritis

OREGON HEALTH & SCIENCE UNIVERSITY

Carpal Tunnel Syndrome

- History & examination are most important tools in diagnosis
  - Night pain in median nerve distribution
  - Sensory changes in median nerve
  - Median nerve compression test
  - EMG/NCS helpful in diagnosis

OREGON HEALTH & SCIENCE UNIVERSITY

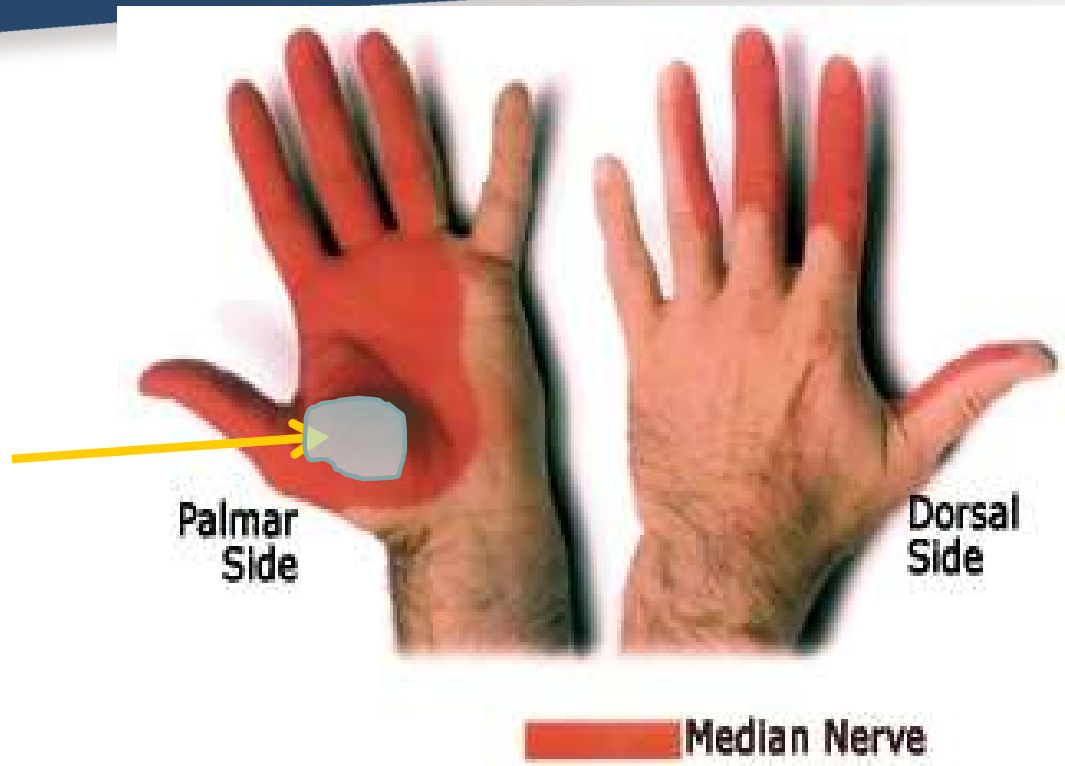
Carpal Tunnel Syndrome

- X-rays, CT scan, MRI **not** useful
- EMG/NCS are helpful in confirming diagnosis
  - Cervical spine/nerves
  - Diabetes
  - Difficult exam
- US used to show ratio of median nerve to carpal tunnel

OREGON HEALTH & SCIENCE UNIVERSITY

Carpal Tunnel Syndrome

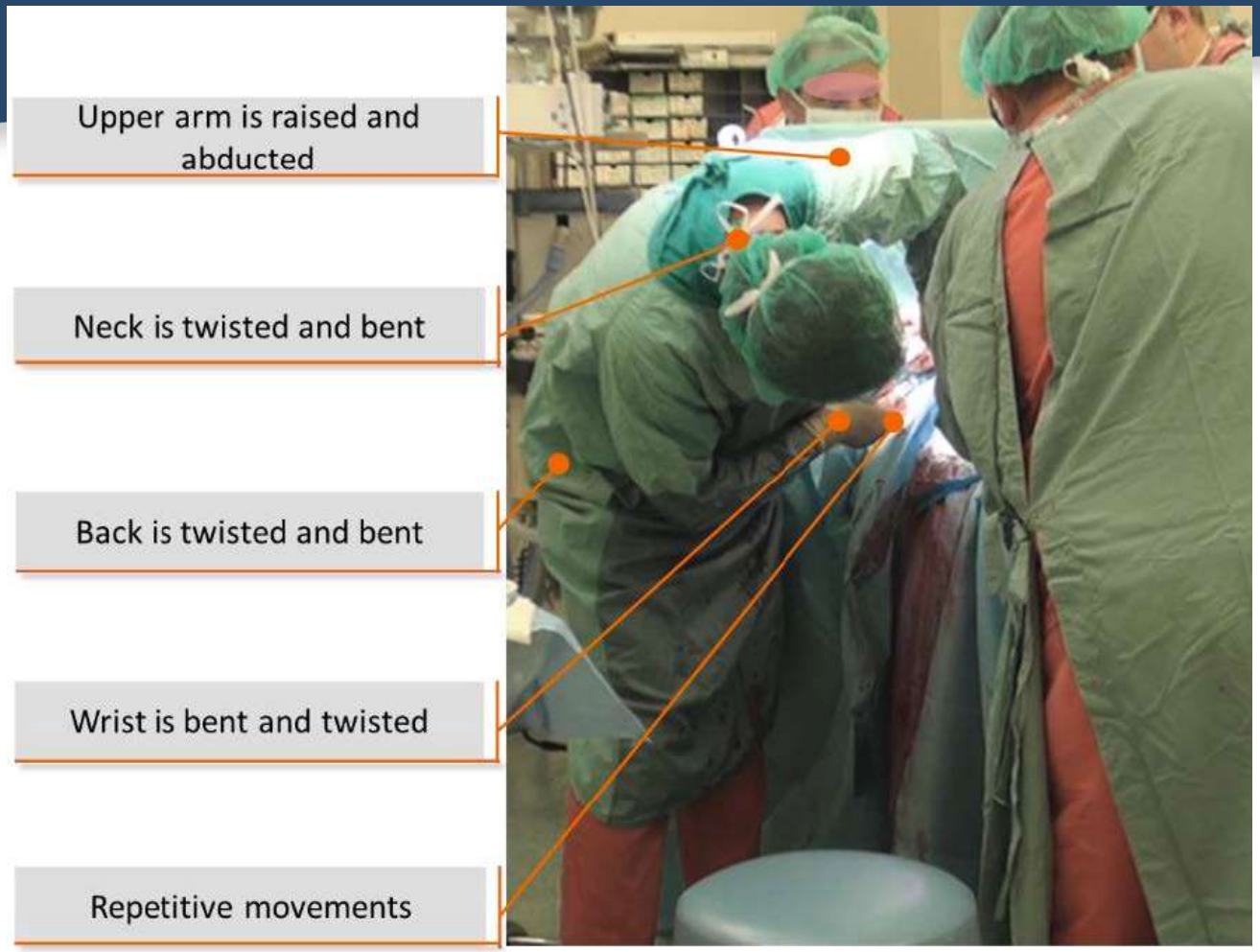
- Pain along median nerve
- Paresthesias in median nerve distribution
- Normal thenar sensation



OREGON HEALTH & SCIENCE UNIVERSITY

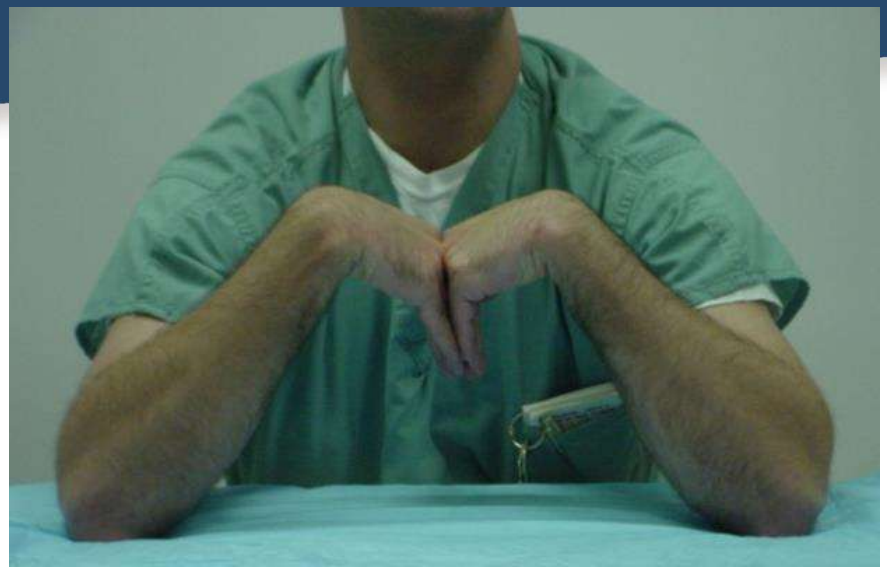
Carpal Tunnel Syndrome

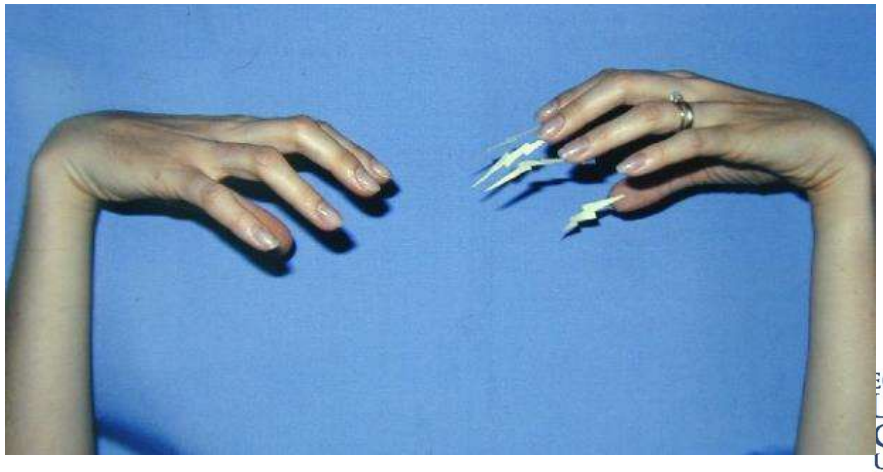
- Symptoms worse at night (waking up)
- Extreme wrist positions
  - Talking on phone
  - Driving
- Dropping objects due to weakness or altered sensibility
  - Cups, dishes



Phalan's Test

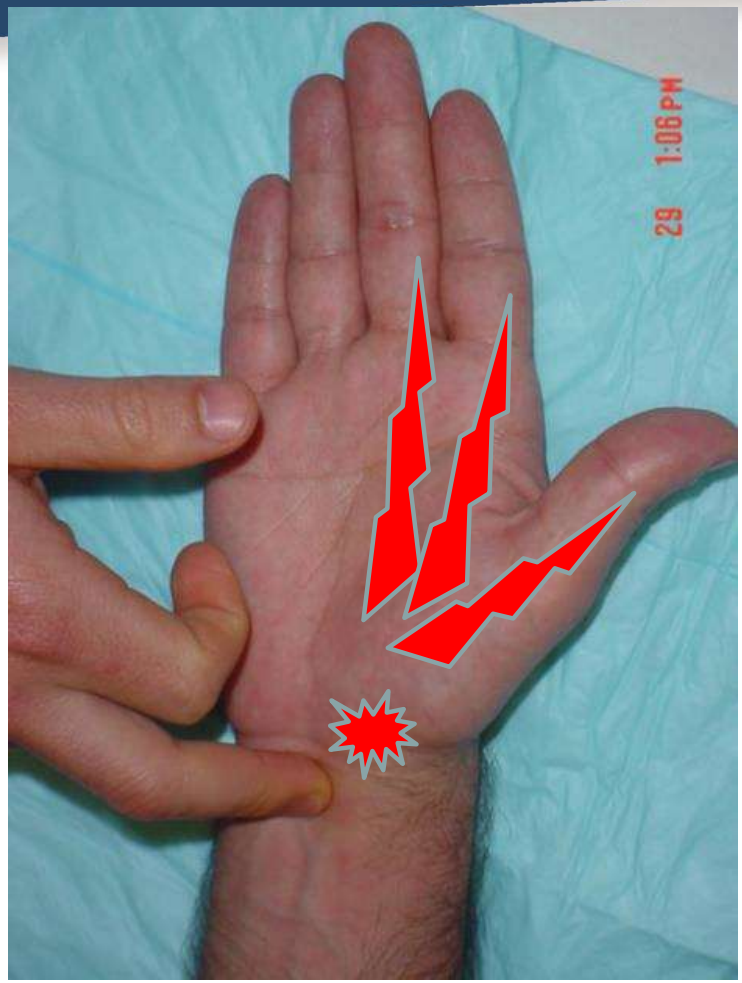
- Wrist flexion with elbow on table
- Paresthesia in response to position
- Numbness and tingling in radial digits in 60 sec. = pos. test
- Probable CTS (sen.0.75, spec. 0.47)





Tinel's Sign

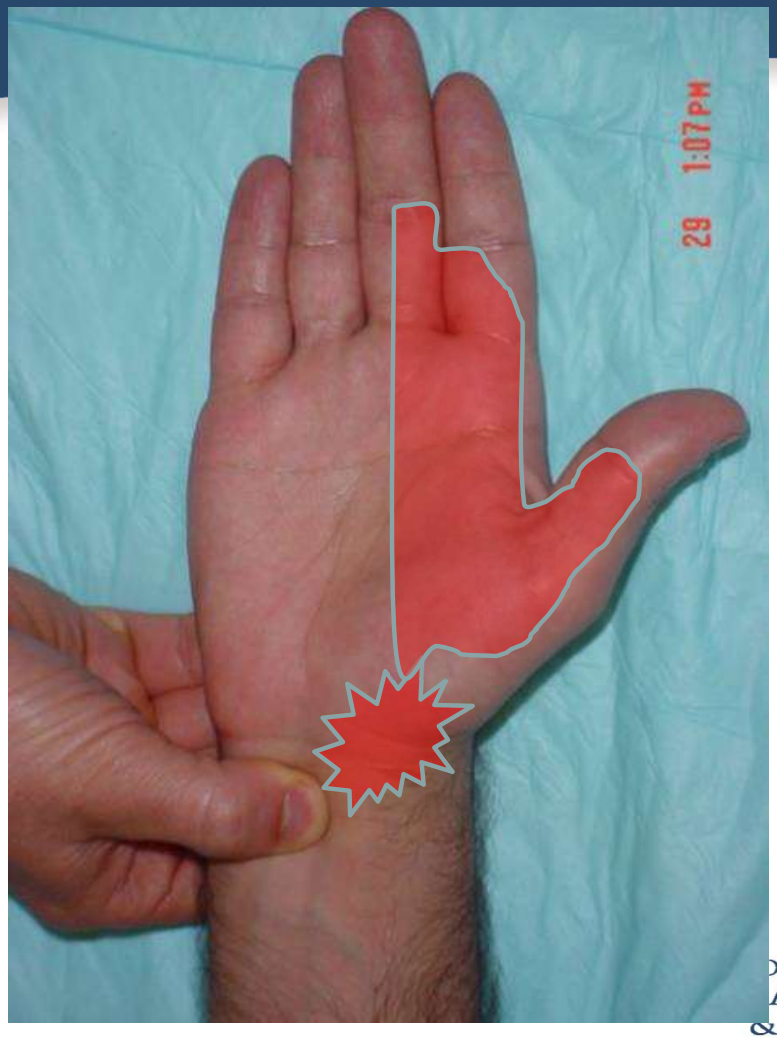
- Tap on median nerve at wrist
- Site of irritable nerve due to axonal injury
- Tingeling and shooting pain in nerve dist.
- Probable CTS (sen. 0.60, spec. 0.67)



OREGON HEALTH & SCIENCE UNIVERSITY

Carpal Tunnel Compression Test

- Direct compression of median nerve
- Paresthesia in response to pressure
- Paresthesia occur within 30 sec.
- Probable CTS (sen. 0.87, spec. 0.90)

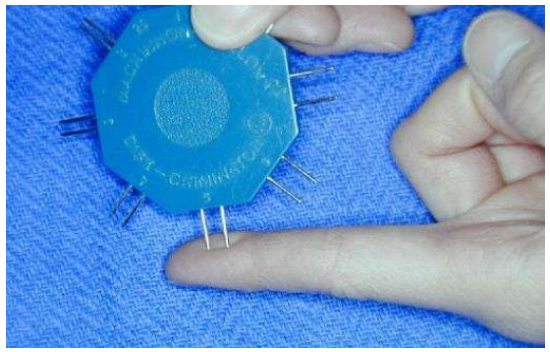


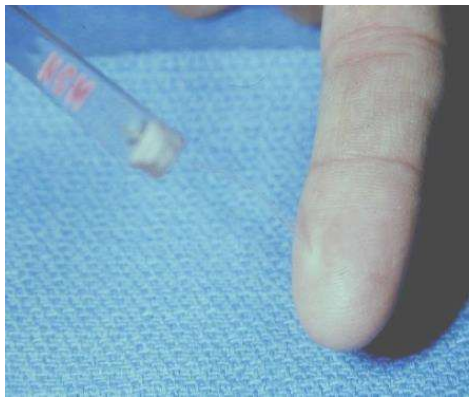
OREGON HEALTH & SCIENCE UNIVERSITY

Sensory Testing

- Static two point discrimination >6 mm = advanced nerve dysfunction or nerve laceration

- Monofilaments testing is better
- Value greater than 2.83gm in radial 3 digits
- Probable CTS (sen. 0.83)





OREGON HEALTH & SCIENCE UNIVERSITY

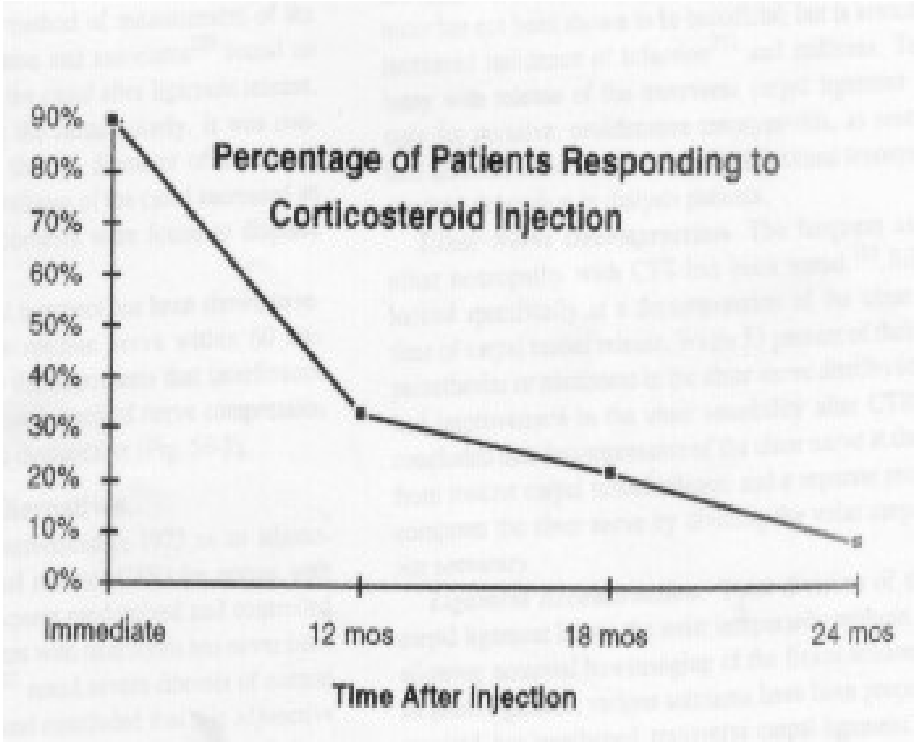
Carpal Tunnel Syndrome

- Early
  - Intermittent symptoms
  - No weakness of thumb abduction
  - No permanent numbness or paresthesias
  - No atrophy
  - Treatment = wrist splints, activity modification, limb positioning 6–8 weeks
  - Cortisone injections

OREGON HEALTH & SCIENCE UNIVERSITY

Steroid Injections

- Mild symptoms less than 12 months
- No weakness
- Intermittent sensory changes
- Offer transient relief in 80% patients at 6 weeks
- Only 22% are symptom free at 12 months

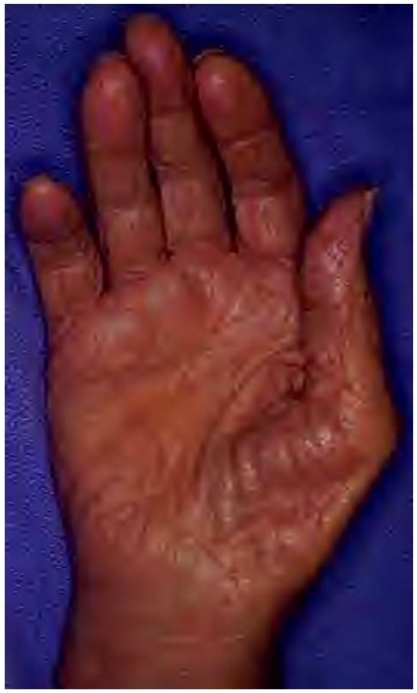


Wood et al, Gelberman et al, + Girlanda et al.

OREGON HEALTH & SCIENCE UNIVERSITY

Carpal Tunnel Syndrome

- Late
  - Sensory loss
  - Muscle atrophy
  - Weakness grasping objects
  - +/- Pain
  - Treatment = surgical decompression
  - Surgery will halt progression & pain



OREGON HEALTH & SCIENCE UNIVERSITY

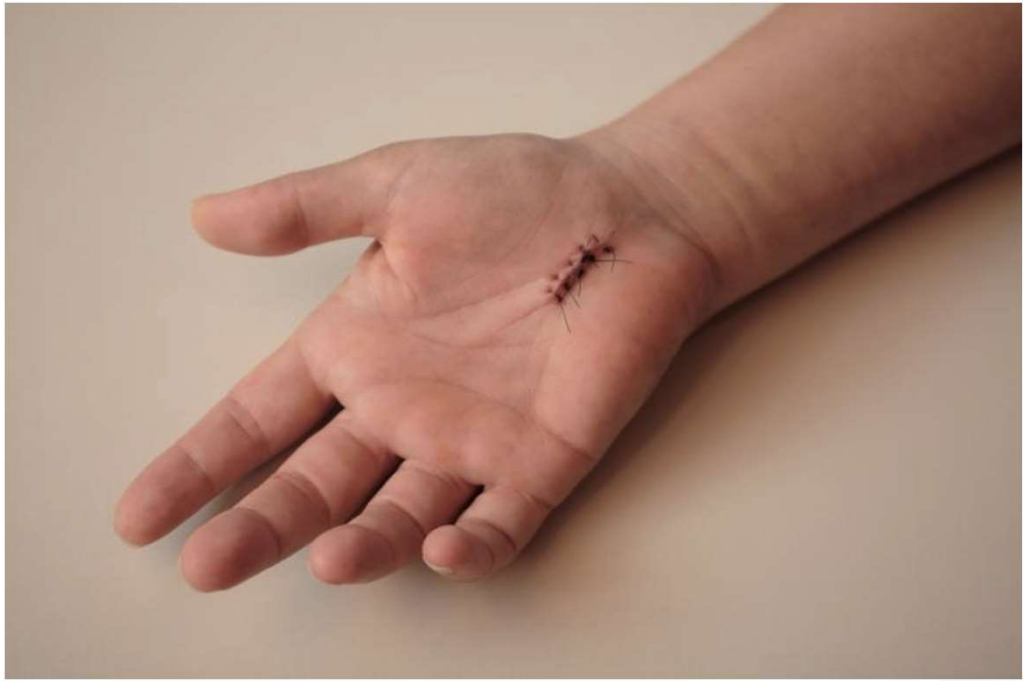
Surgical Techniques

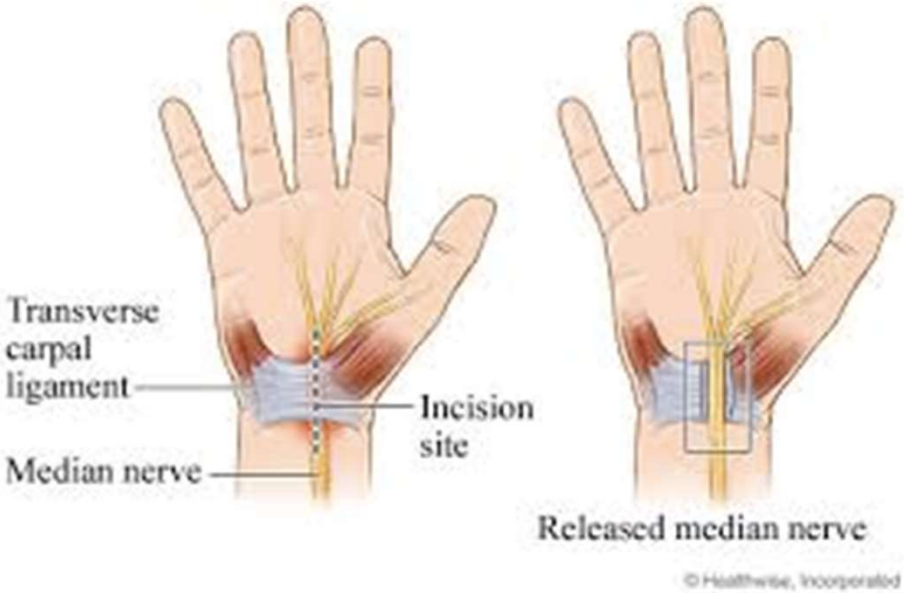
- What is the better surgical technique?
  - **Open release**
  - **Endoscopic release**

- **Short answer** – which ever your surgeon is most comfortable with

OREGON HEALTH & SCIENCE UNIVERSITY

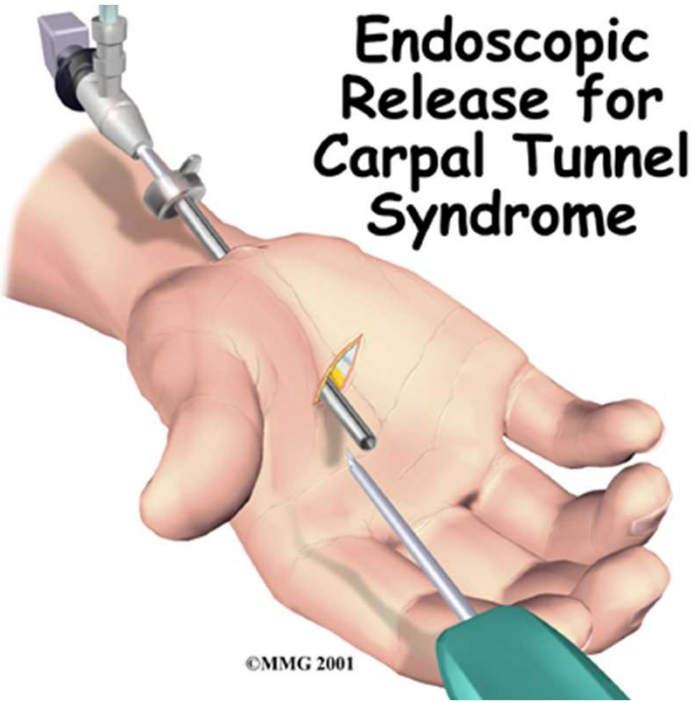
Open Technique

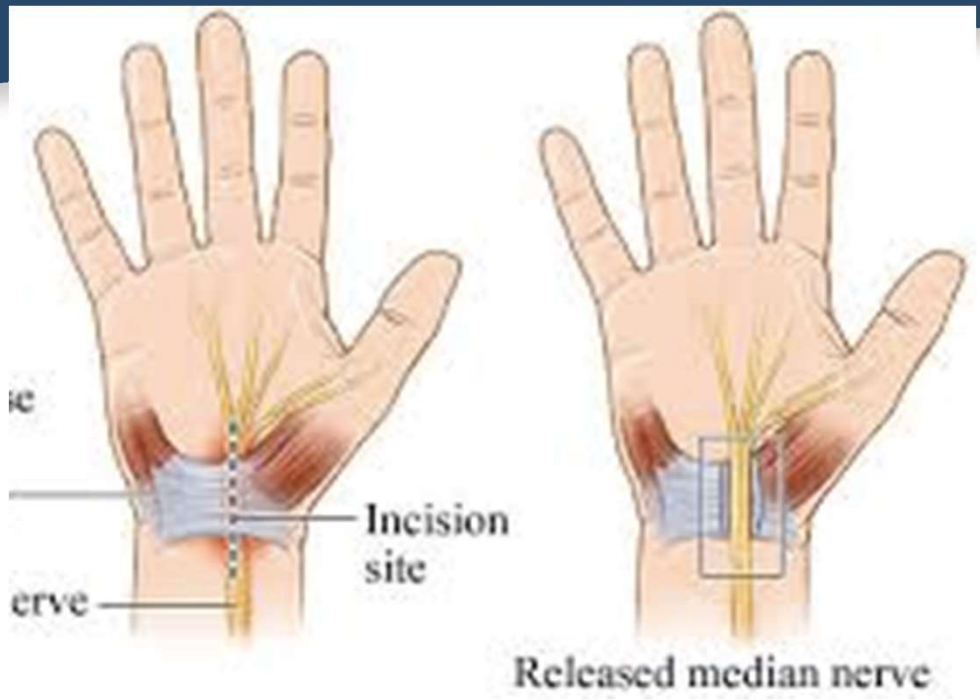




OREGON HEALTH & SCIENCE UNIVERSITY

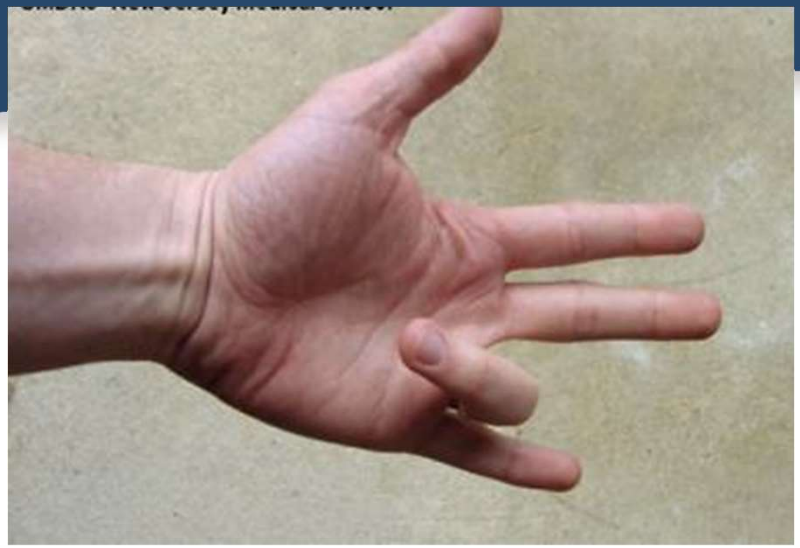
Endoscopic Technique





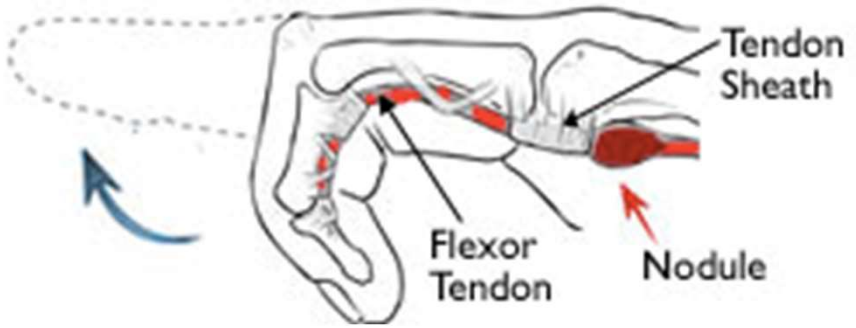
OREGON HEALTH & SCIENCE UNIVERSITY

Trigger finger



- Clicking or catching with finger flexion
- Tender lump in the palm
- Swelling

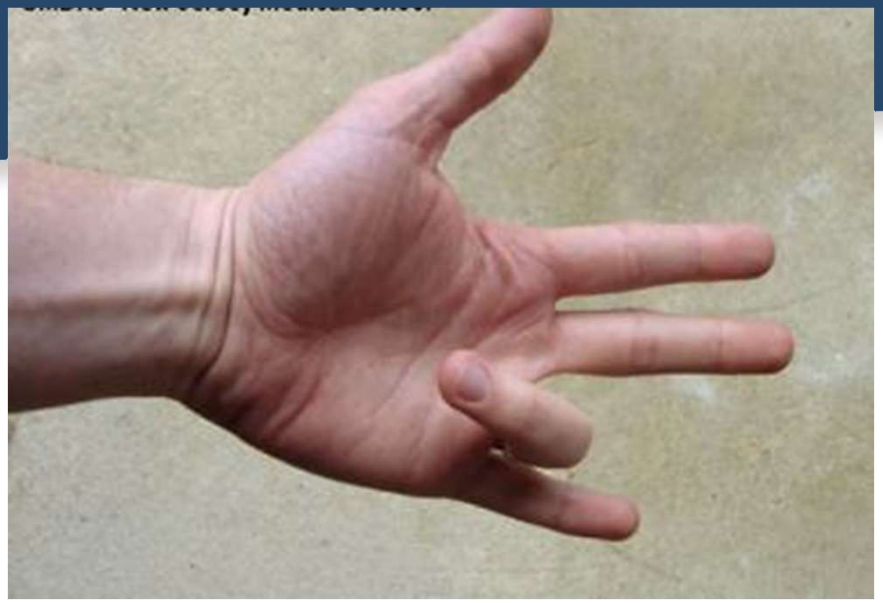
- Cause is typically unknown
  - Women > men
  - Age 40 to 60
  - Diabetes and RA

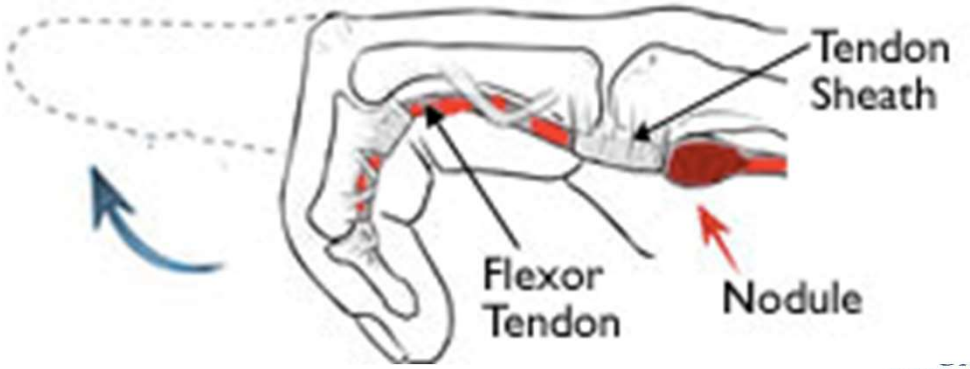


OREGON HEALTH & SCIENCE UNIVERSITY

Trigger finger

- Treatment
  - Splinting
    - Can be used up to 12 weeks with good results
  - Cortisone injection
    - Highly predictable short/medium term relief
      - 50% long term relief
  - Surgical release
    - >95% effective
    - Immediate use
    - Residual swelling for several weeks

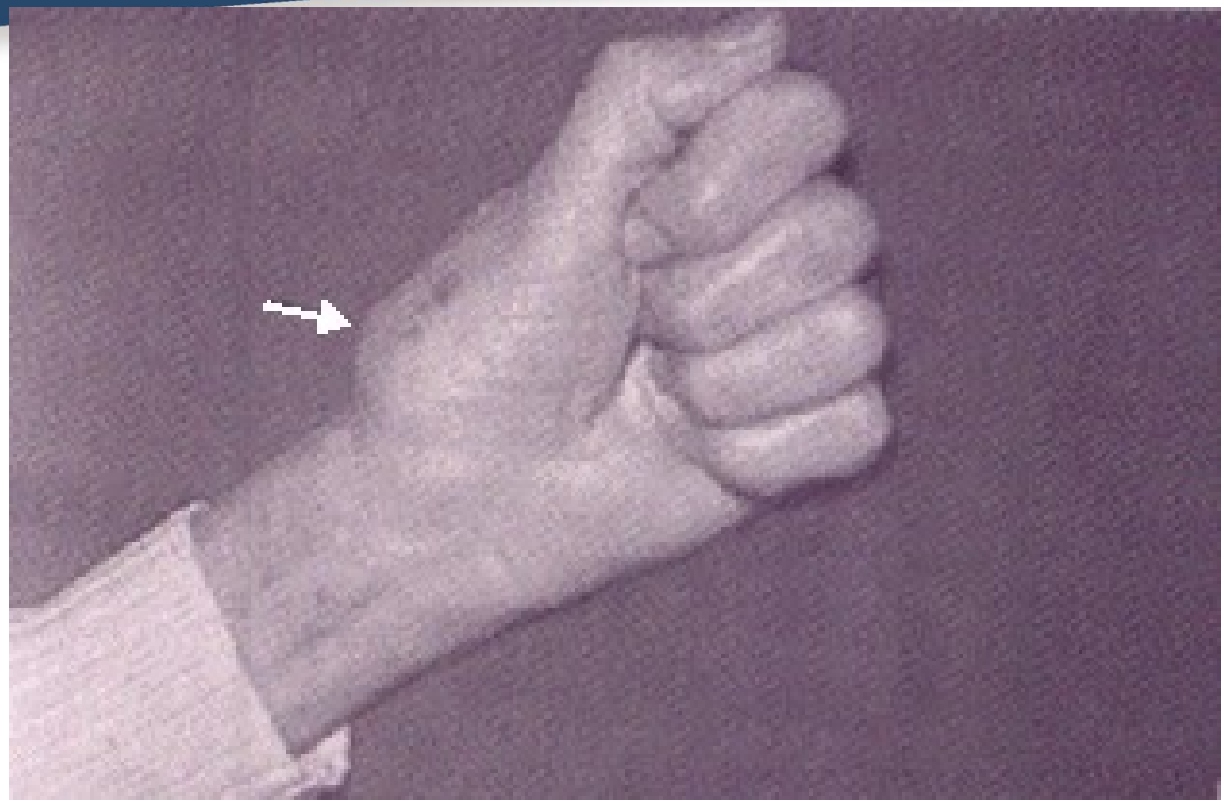




OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

- Most common is OA in females, 45 – 65 y.o.
- 1 in 4 women, vs 1 in 12 men



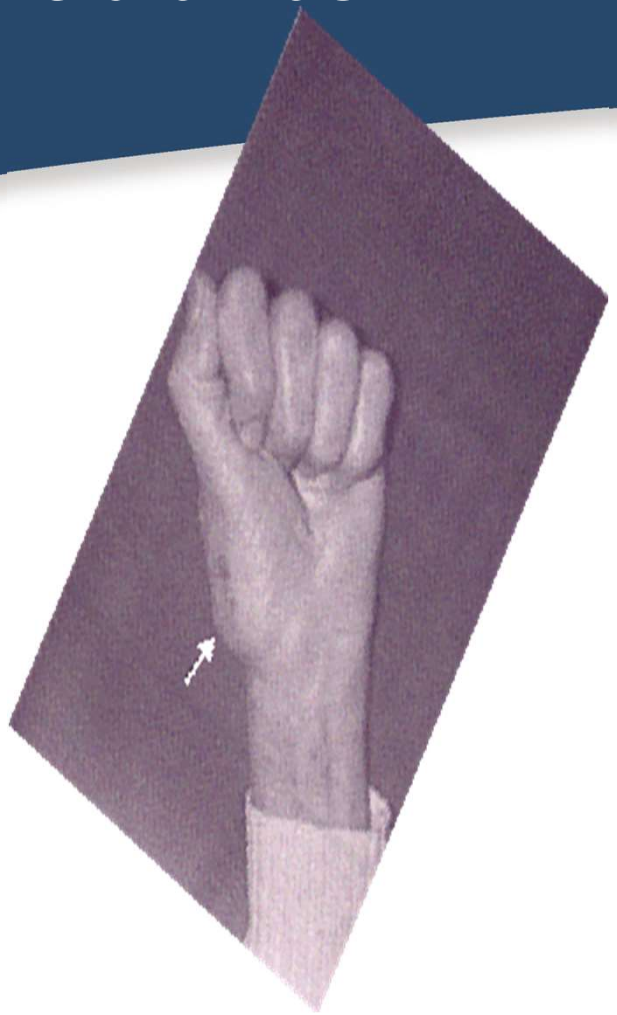
OREGON HEALTH & SCIENCE UNIVERSITY

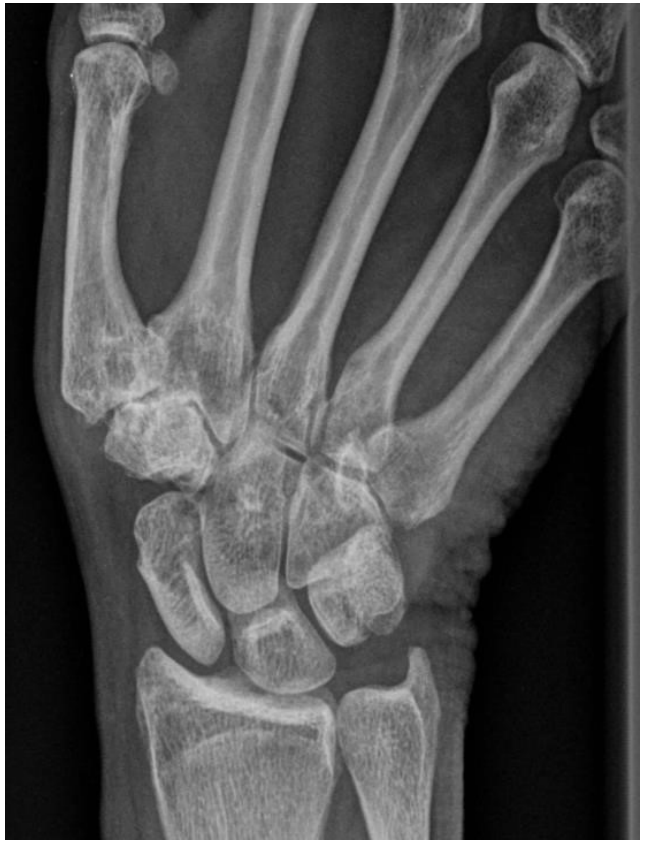
Thumb CMC arthritis

- Patient develops pain and loss of pinch strength as CMC becomes adducted, MCP hyperextends
- Everyday tasks like opening jars, buttoning pants
- Cooking, holding pots/pans becomes very challenging

OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

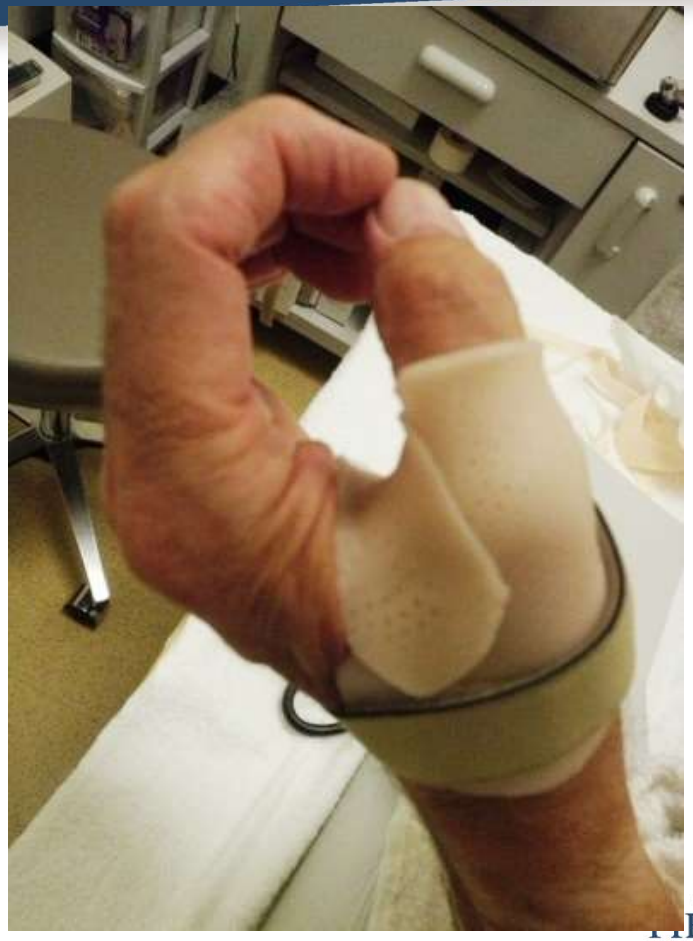




OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

- Splinting
  - Pain relief
  - Improves joint stability
  - Wear during heavy or painful activity
- Anti-Inflammatories - NSAIDs
  - Ibuprofen/Advil/Aleve/Motrin
  - All similarly effective
- Voltaren gel, lidocaine patch
  - Useful adjuncts



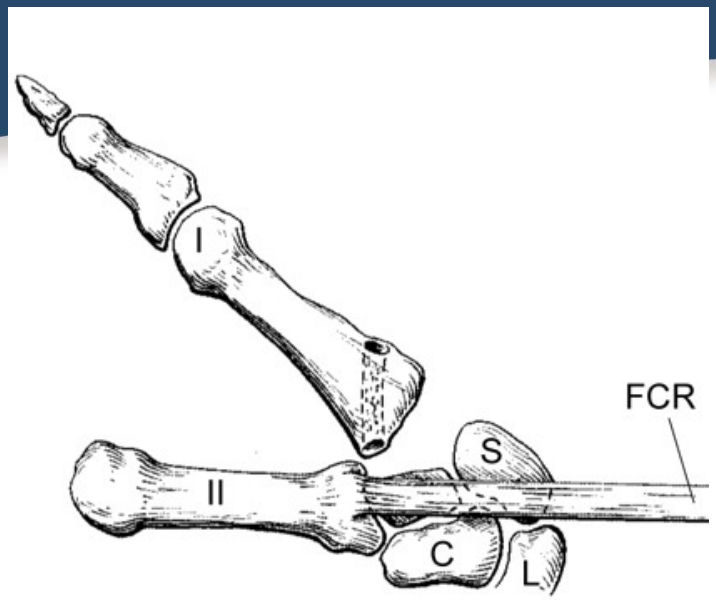
OREGON HEALTH & SCIENCE UNIVERSITY

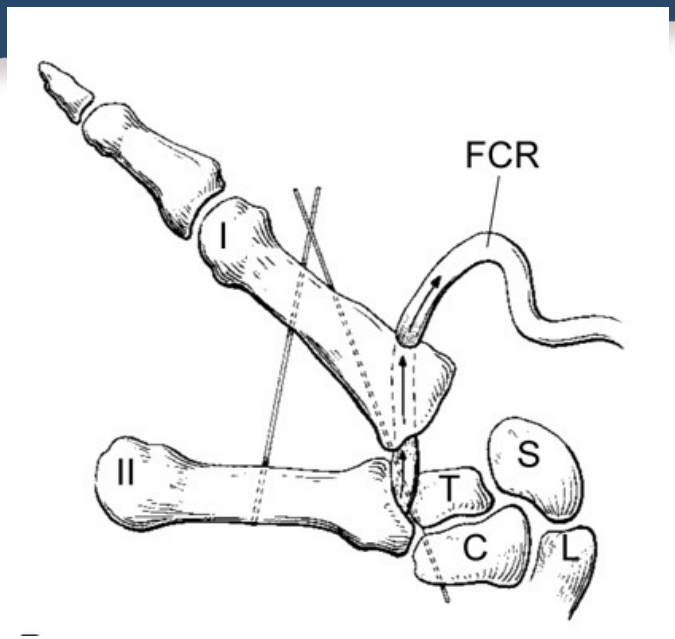
Thumb CMC arthritis

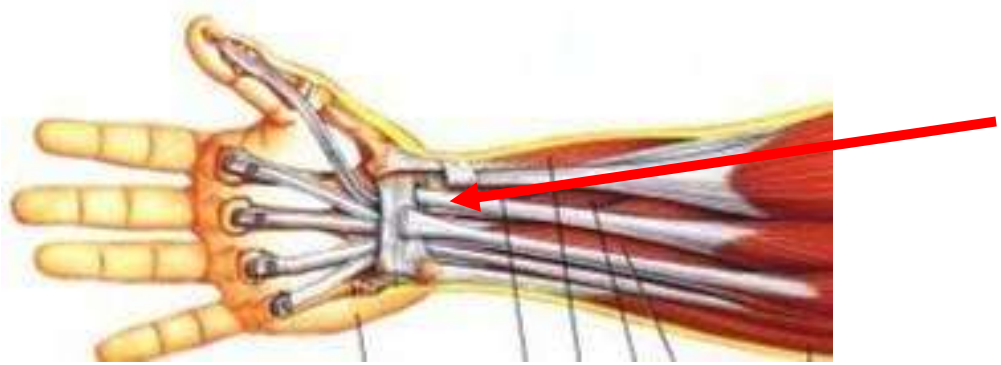
- Failed nonoperative treatments
- Many techniques described using soft tissue and/or prosthetic implants
- Trapeziectomy with Ligament reconstruction & tendon interposition (LRTI) described 20 years ago with good long term results

OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

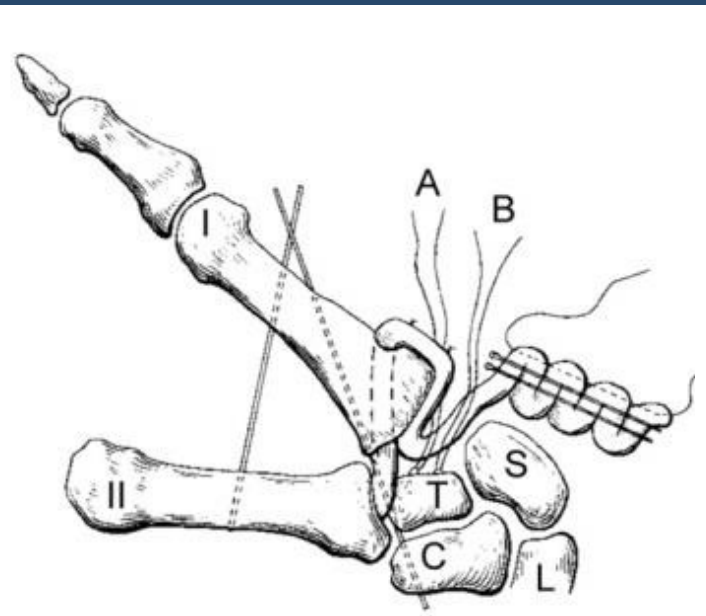


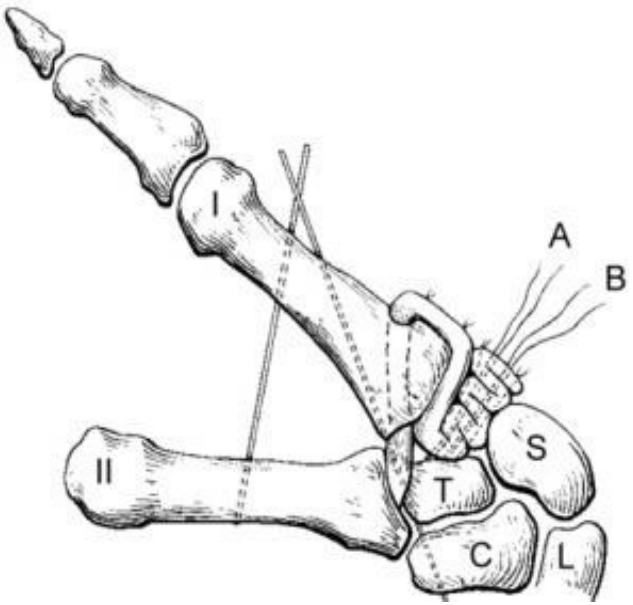


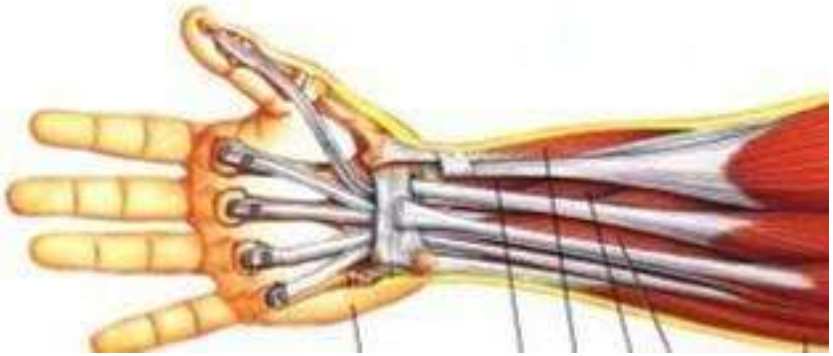


OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis, #5



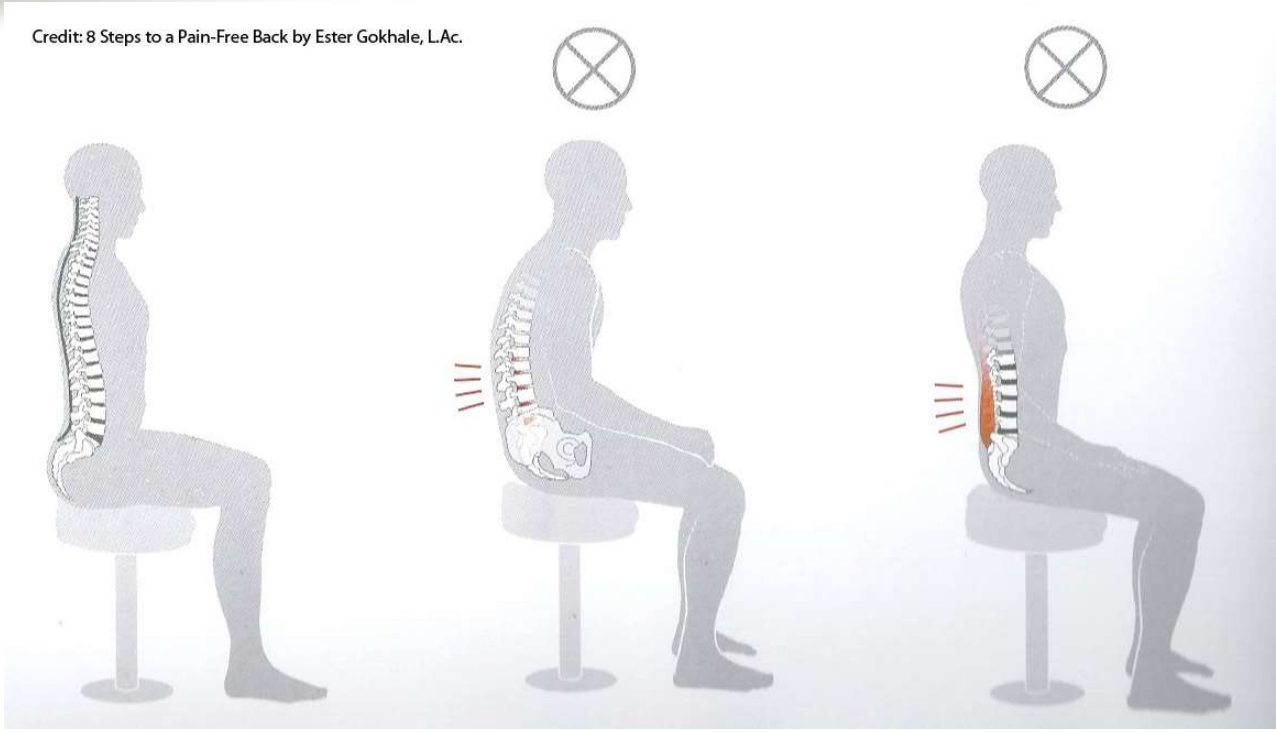




OREGON HEALTH & SCIENCE UNIVERSITY

Sitting

- Knees bent 90
- Feet flat on floor
- Work between 0- 10 cm below elbow height



Azimuddin AF, Weitzel EK, McMains KC, Chen PG. An ergonomic assessment of operating table and surgical stool heights for seated otolaryngology procedures. *Allergy Rhinol (Providence)*. 2017;8(3):182-188.

OREGON HEALTH & SCIENCE UNIVERSITY

Wrong Way

OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

- Splint placed in OR
- Remains for 2 weeks
- Out of splint and into thumb spica cast x 4 weeks

OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

- Cast removed after 6 weeks
- Hand based thumb splint
- Up to 4 months at night
- Wean out of splint during activity as motion improves
- ROM
  - Thumb opposition
  - Wrist flexion/extension
  - Wrist ulnar/radial deviation
- Taking FCR: studies show this does not affect functional use of the wrist

OREGON HEALTH & SCIENCE UNIVERSITY

Thumb CMC arthritis

- High satisfaction > 95% pain relief
- Grip strength, tip pinch, lateral pinch
  - 70% of normal published values
- Range of motion 95% of normal
- Most people return to full activities around 3 months
- Improvements can be seen for up to 6 years from surgery

OREGON HEALTH & SCIENCE UNIVERSITY

DeQuervains Disease

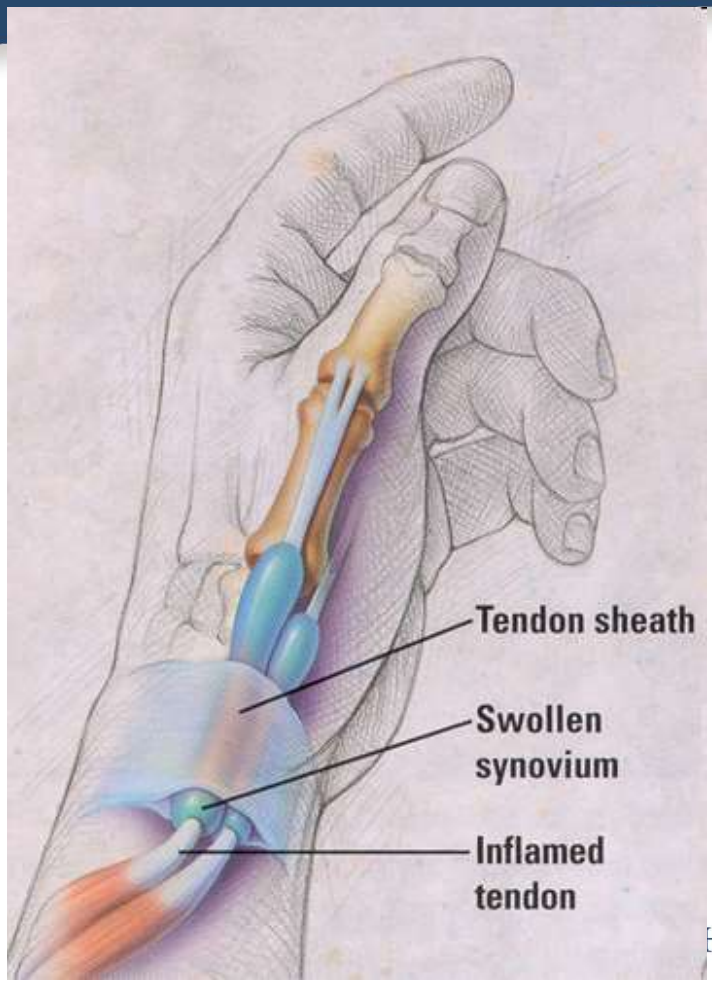
- First described by Fritz DeQuervain 1895
- Stenosing tenosynovitis of the first dorsal compartment
- Seen in an profession or activity that involves
  - Radial deviation
  - Repetitive thumb use
  - New parents

Fritz De QUERVAIN
1868–1940

OREGON HEALTH & SCIENCE UNIVERSITY

DeQuervains Disease

- Golf, fishing, racquet sports
- Abductor pollicis longus, extensor pollicus brevis
- Ride in a groove on radial side of wrist



OREGON HEALTH & SCIENCE UNIVERSITY

DeQuervains Disease

- Finkelstein's test
  - At the end
- H. Finkelstein, JBJS, 1930
  - American surgeon
- Thumb placed in the palm and held with the fingers
- Ulnar deviation causes intense pain over the radial styloid which disappears if the thumb is released.

DeQuervains Disease

- Swelling tenderness over the site
- Crepitus or triggering can be noted
- Palpable fibrous thickening
- Occasional ganglion

OREGON HEALTH & SCIENCE UNIVERSITY

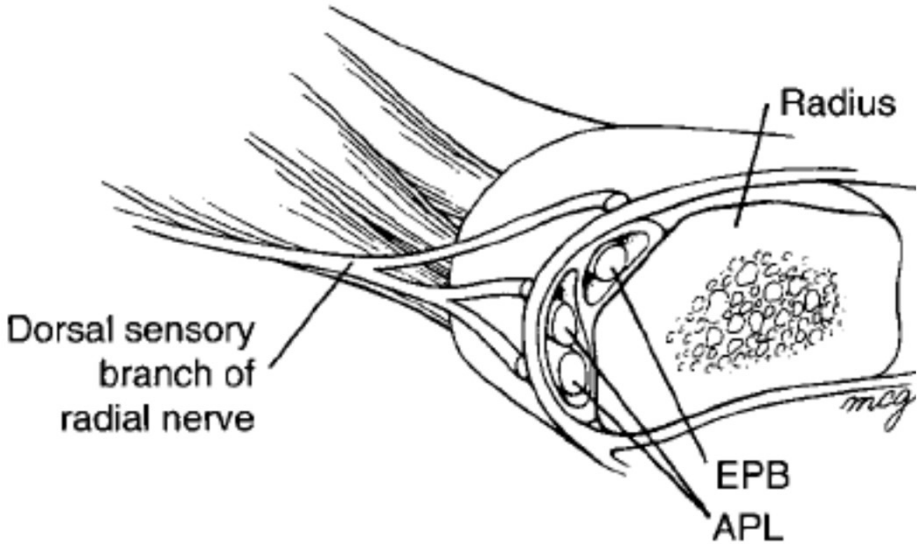
DeQuervains Disease

- Treat based on stage
- RICE
  - Thumb spica splint
- Corticosteroid injection
  - Effective cure rates 62-100%
- Lack of improvement after 6-8 weeks
  - Surgical release

OREGON HEALTH & SCIENCE UNIVERSITY

DeQuervains Disease

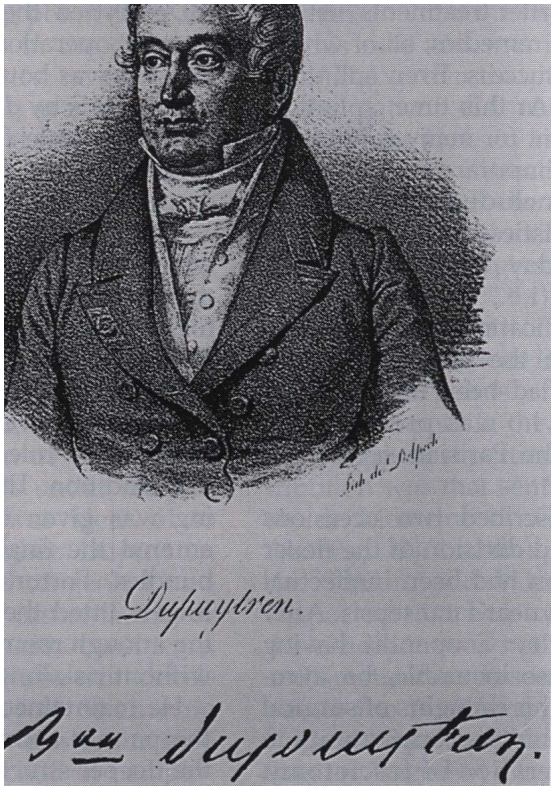
- APL and EPB are within separate compartments
  - 30% - but higher in symptomatic people
- APL has multiple slips
  - 56-81% of the time



OREGON HEALTH & SCIENCE UNIVERSITY

Dupuytrens Contracture

- Condition of the hand characterized by the formation of new tissue in the form of **nodules** and **cords**
- Has features in common with benign fibromatosis
- Tissue undergoes contraction and maturation similar to wound healing



Baron Guillaume Dupuytren

OREGON HEALTH & SCIENCE UNIVERSITY

Dupuytrens Contracture

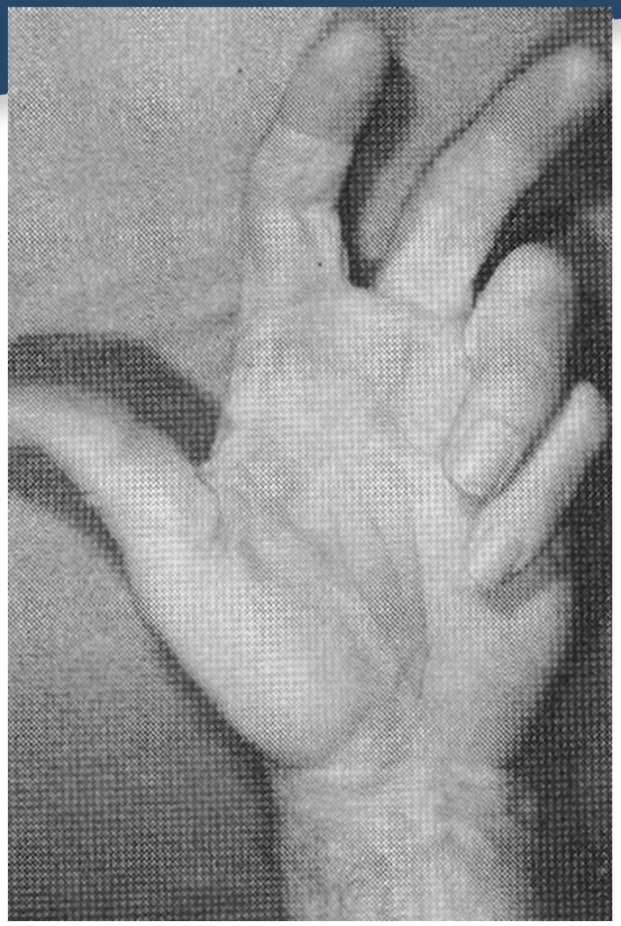
- Autosomal Dominant: based on studies in Norway
- Thought to have originated with Vikings
- Increased Prevalence in Scandinavian, British and Irish Descent
- 7:1 male to female ratio
  - Less severe with later onset in women
- Typically presents in 5th to 7th decade

OREGON HEALTH & SCIENCE UNIVERSITY

Dupuytrens Contracture

- Typical Disease: Dupuytren Diathesis
  - male, Caucasian, northern European
  - Bilateral, AD
  - Nodule to cord
  - Associated with Garrod's nodes (knuckle pads), Ledderhose Disease (plantar fibromatosis), and Peyrones Disease (penile fibromatosis)
  - Much poorer surgical outcomes

Clinical Presentation



- Usually seek medical attention after nodule or cord is noticed
- Occasionally referred with dx of trigger finger
- Often painless
  - Therefore sometimes do not present until joint motion compromised

OREGON HEALTH & SCIENCE UNIVERSITY

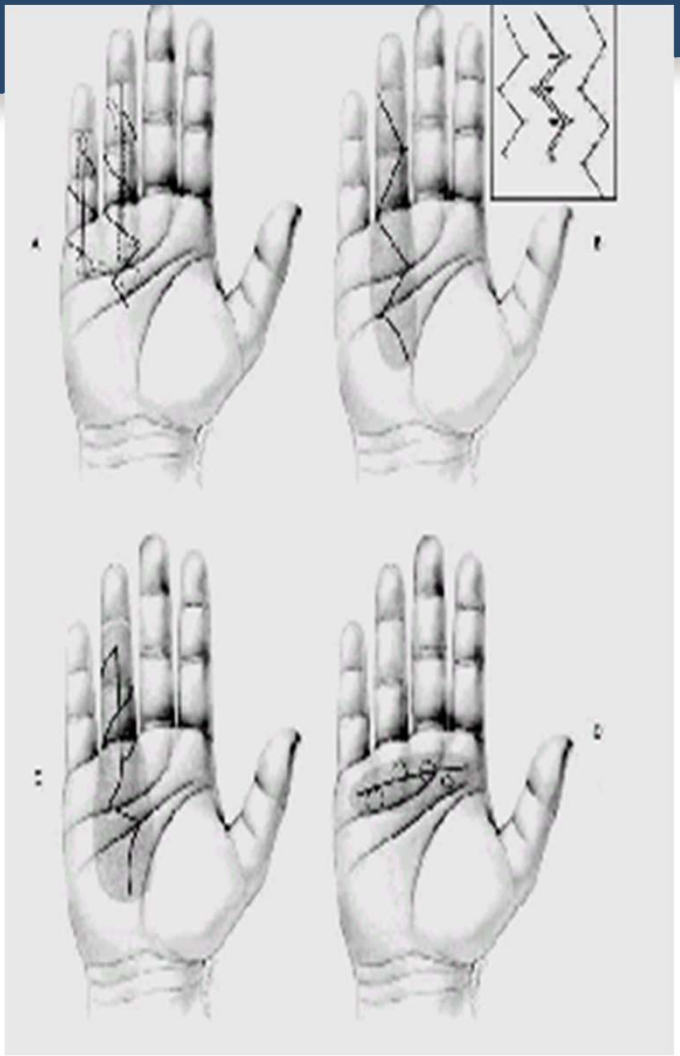
Dupuytrens Contracture

- Treatment
  - Non-operative is of limited efficacy
    - Splinting, bracing
    - Steroid, *radiation therapy, upcoming studies*
  - Xiaflex (clostridium histolytica)
    - Injected in clinic on one day
    - Manipulation 1 – 7 days later
    - Skin tears, slightly highly reoccurrence but very well tolerated
  - Needle aponeurotomy
    - Limited to MCP crease

OREGON HEALTH & SCIENCE UNIVERSITY

Dupuytrens Contracture

- Treatment
  - Surgery indicated when contracture affects function
  - 30 degrees of MCP flexion
    - Hand flat on the table
  - Any PIP contracture



OREGON HEALTH & SCIENCE UNIVERSITY

Questions?

Omar F. Nazir M.D.,
OHSU Department of Orthopaedic Surgery
Clinic 5034948645
Email Nazir@ohsu.edu

OREGON HEALTH & SCIENCE UNIVERSITY