

ACUTE HAND TRAUMA AND INFECTIONS

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HAND AND UPPER EXTREMITY SURGEON

TULSA BONE & JOINT

SAINT FRANCIS HEALTH SYSTEM



OUTLINE

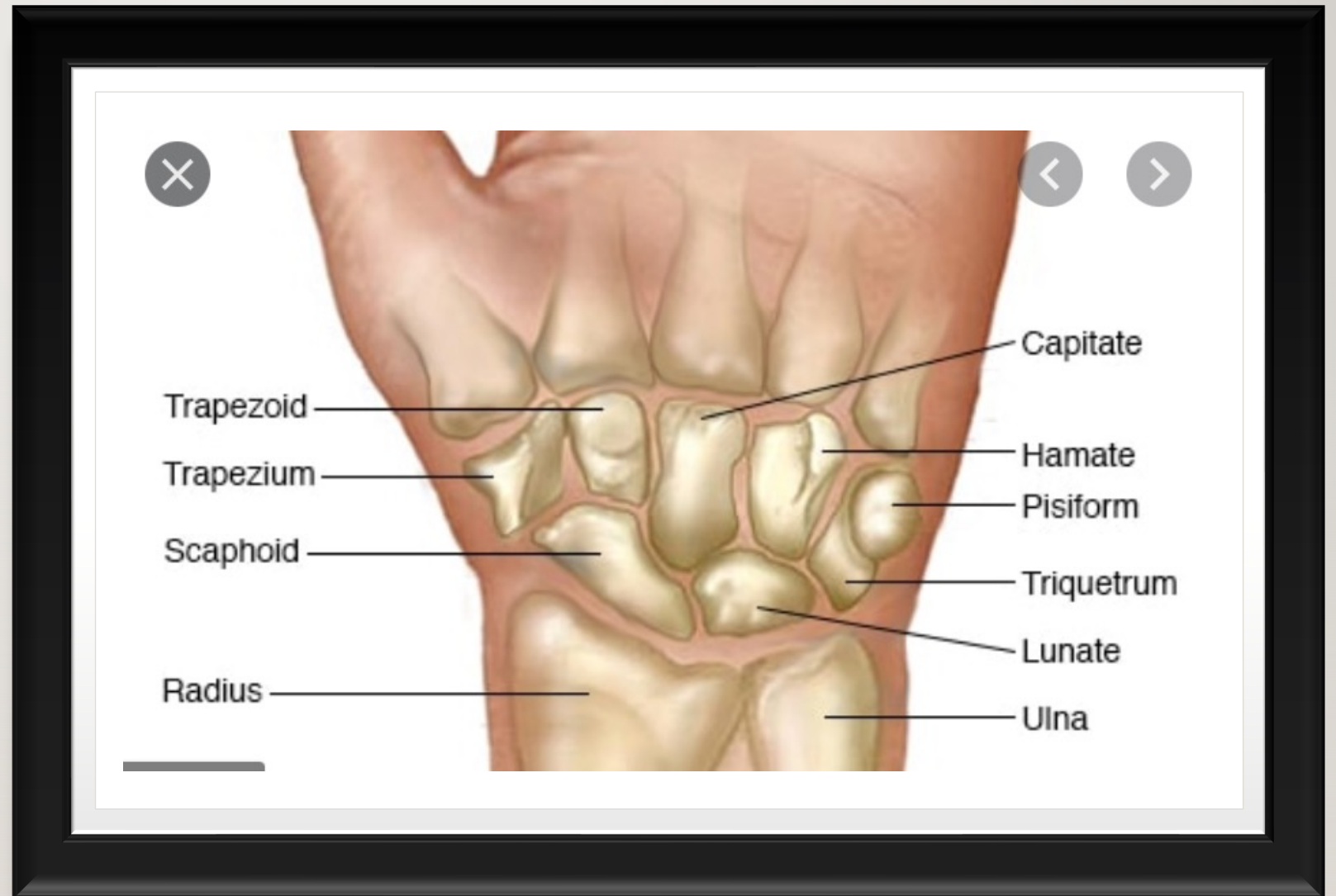
- Anatomy
- Clinical approach to hand injury
 - History
 - Exam
 - Imaging
- Treatment
- Common Hand Injuries
- Common Hand Infections

SKELETAL ANATOMY

- Hand consists of 27 bones
 - 14 Phalanges
 - 5 proximal
 - 4 middle (no middle in thumb)
 - 5 distal
 - 5 Metacarpals
 - 8 Carpal Bones



CARPAL BONES

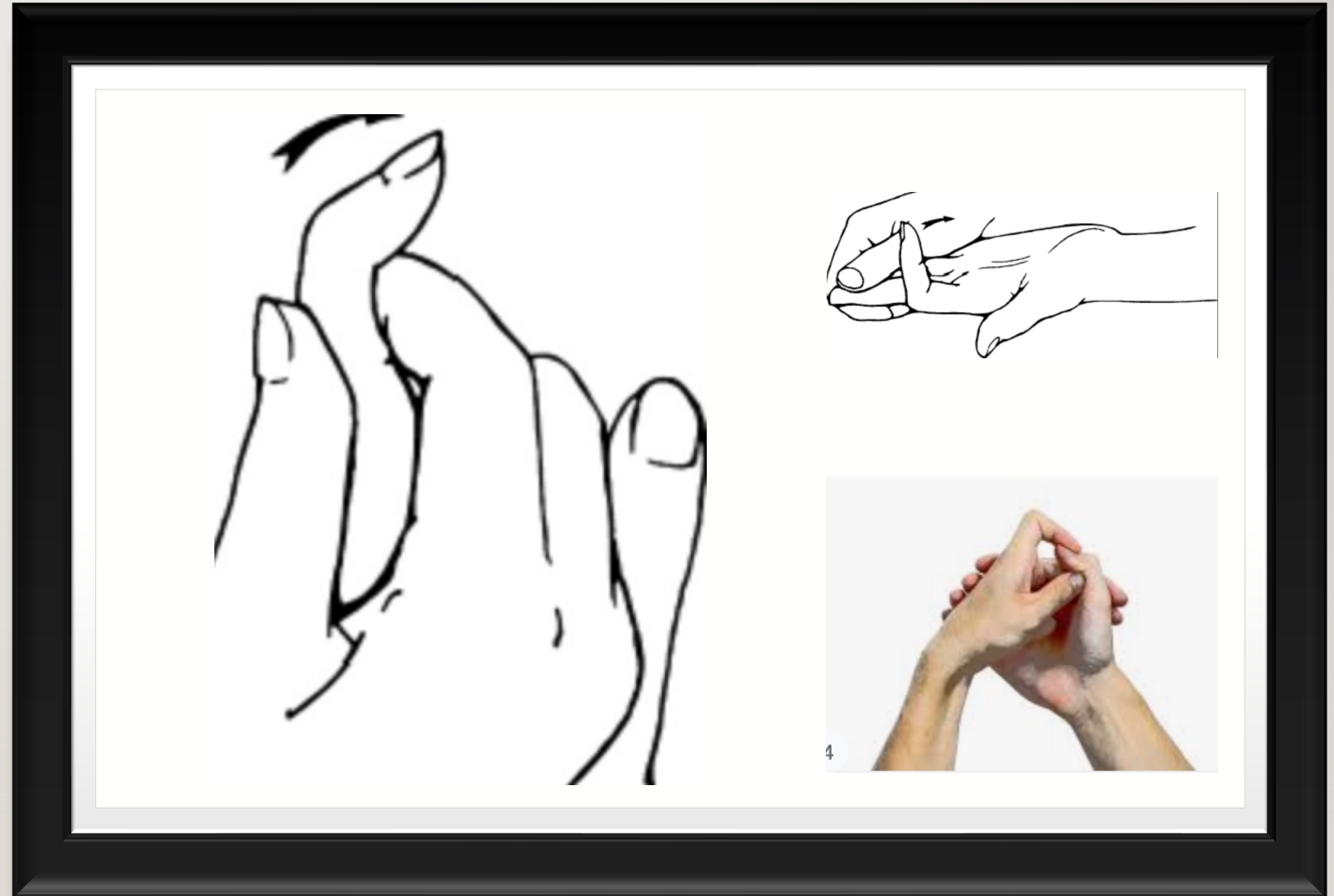


MUSCLE ANATOMY

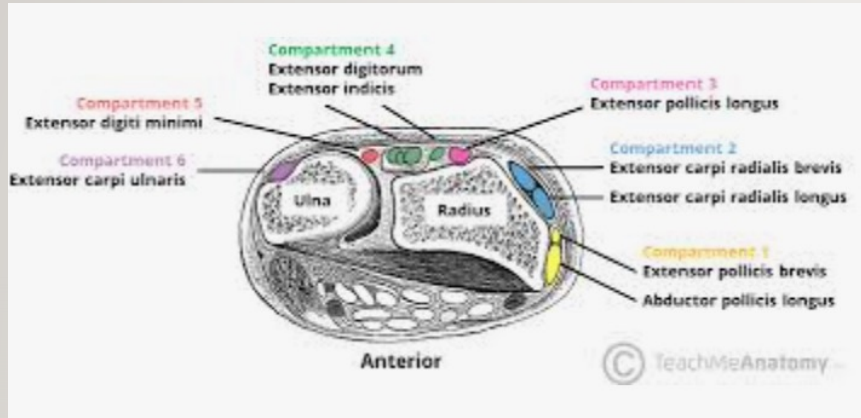
- 2 Main Groups
 - Extrinsic
 - Extensors
 - Flexors
 - Intrinsic
 - Thenar Complex
 - Lumbricals
 - Interosseous
 - Hypothenar Complex

FLEXORS

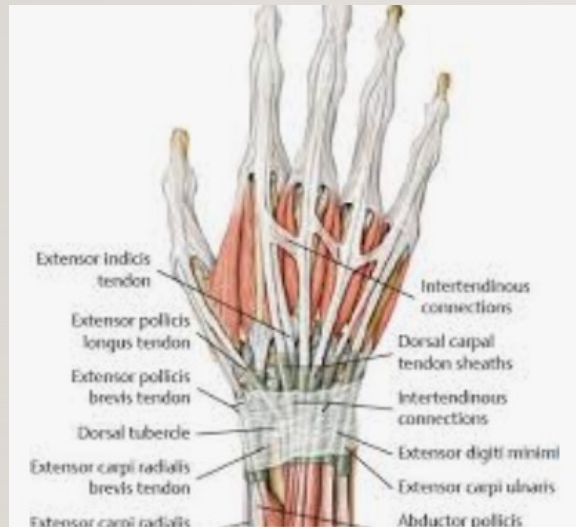
- Flexor digitorum profundus (FDP)
 - Flex DIP joint
- Flexor digitorum superficialis (FDS)
 - Flex PIP joint
- Flexor pollicis longus (FPL)
 - Flex thumb IP joint



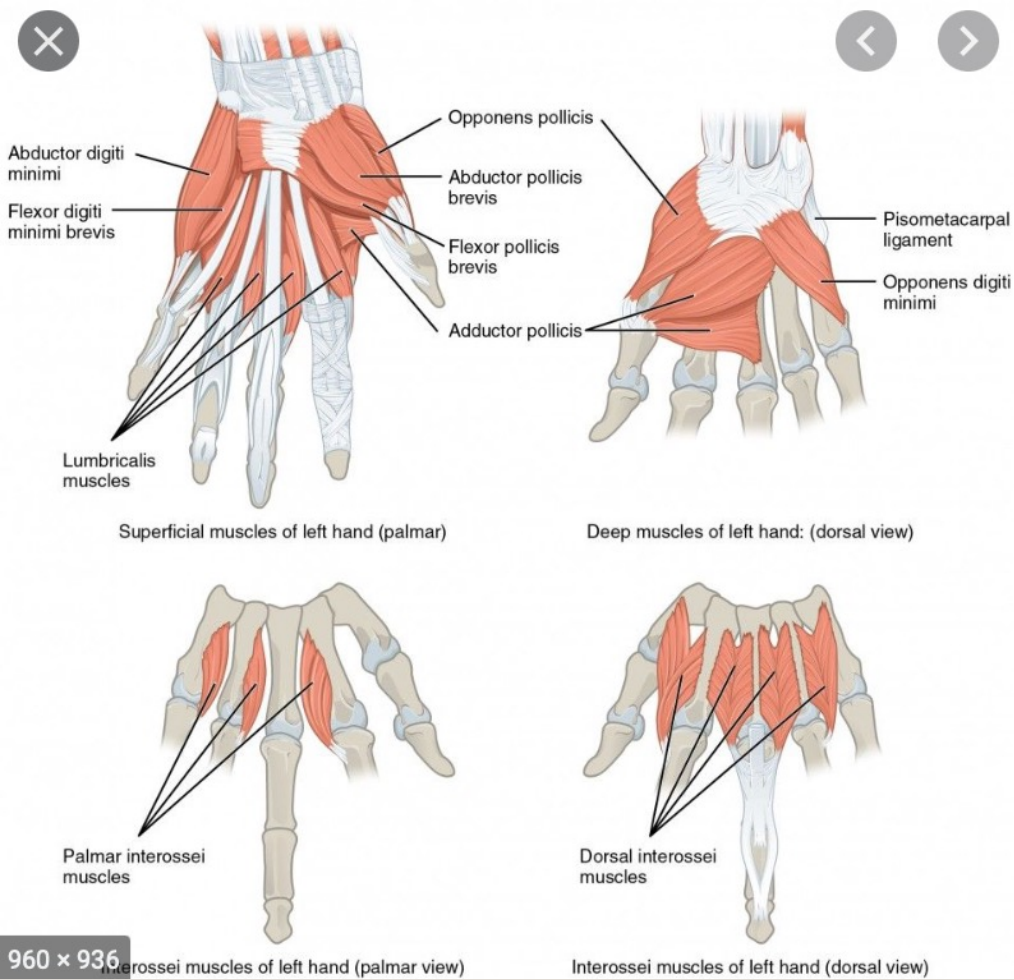
EXTENSORS



- 9 tendons in 6 compartments
 - 1st: APL, EPB
 - 2nd: ECRL, ERCB
 - 3rd: EPL
 - 4th: EDC, EIP
 - 5th: EDM
 - 6th: ECU



INTRINSICS



PULLEY SYSTEM

Finger Anatomy



Bones: Proximal Phalanx, Middle Phalanx, Distal Phalanx

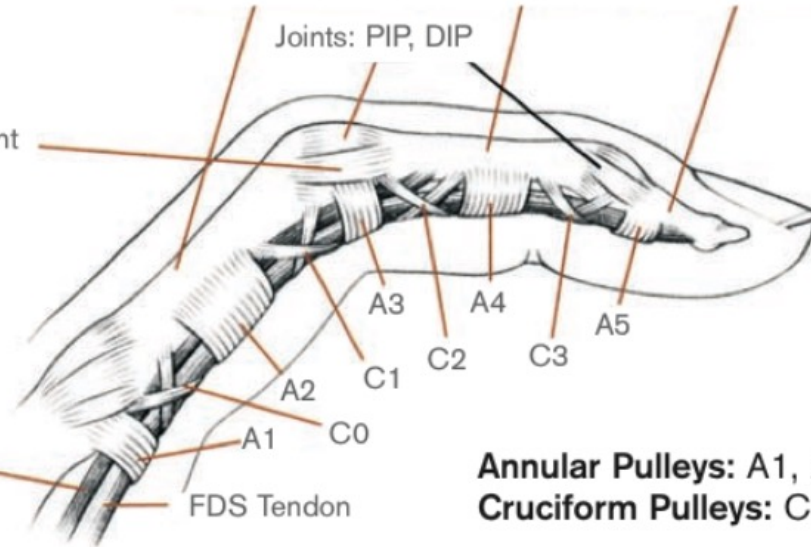
Joints: PIP, DIP

Collateral Ligament

FDP Tendon

FDS Tendon

771 x 414



Annular Pulleys: A1, A2, A3, A4, A5

Cruciform Pulleys: C0, C1, C2, C3

NERVES & BLOOD VESSELS



APPROACH TO HAND TRAUMA

- History
- Exam
- Imaging



HISTORY

- General
 - Age
 - Hand dominance/occupation
 - Past medical history (diabetes, vascular problems, substance abuse)
 - Smoker?
 - Previous hand problems
 - Other injuries?
- When and where did this take place?
 - Many injuries to take time to “declare” themselves
- How did this happen?
- Posture of hand at time of injury?

PHYSICAL EXAM

- General
 - Examine patient while sitting
 - Explain exam
 - Encourage patient to participate in exam/treatment plan
 - Remove rings immediately!
- Skin
 - Location, size, depth
 - Color, temperature
 - Lacerations, burns



RINGS OFF!!





PHYSICAL EXAM

- Circulation
 - Color changes vs. grease stains/paint
 - Capillary refill
 - pulses



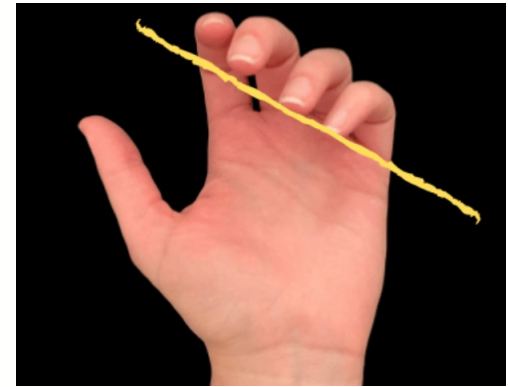
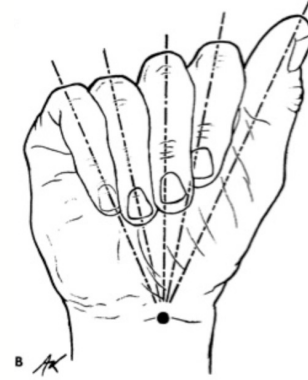
PHYSICAL EXAM

- Neurological Exam
 - Radial and ulnar digital nerves (light sensation vs 2-point)
 - Pinch/grip

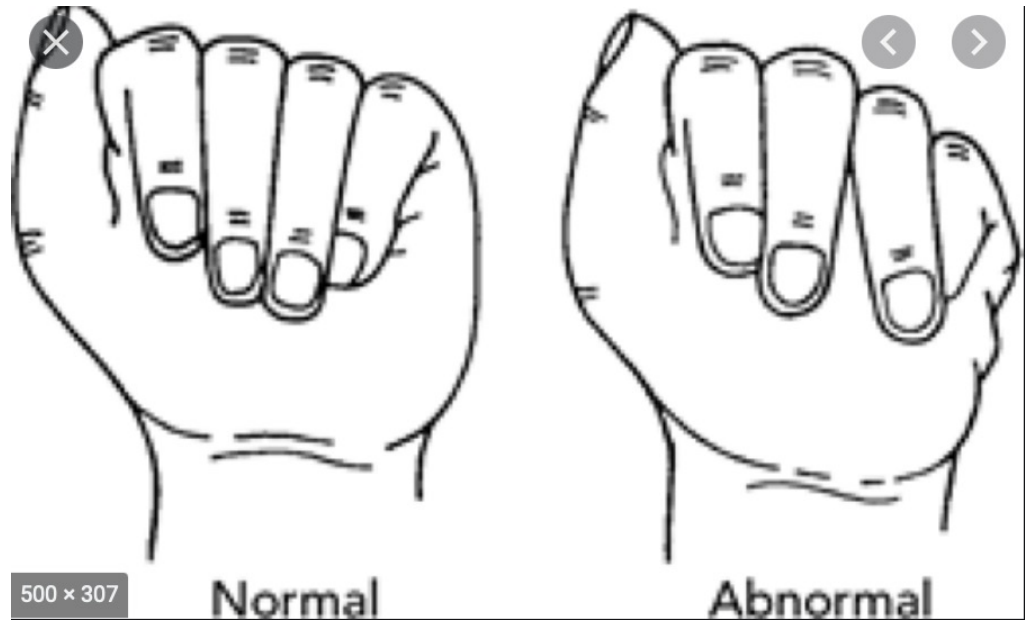


EXAM

- Tendons:
 - Finger cascade
 - Tenodesis
 - Individual tendons



PHYSICAL EXAM



- Bone and Joints
 - Palpate and look for deformity
 - Passive/active range of motion
 - Stability
 - Open vs closed injury

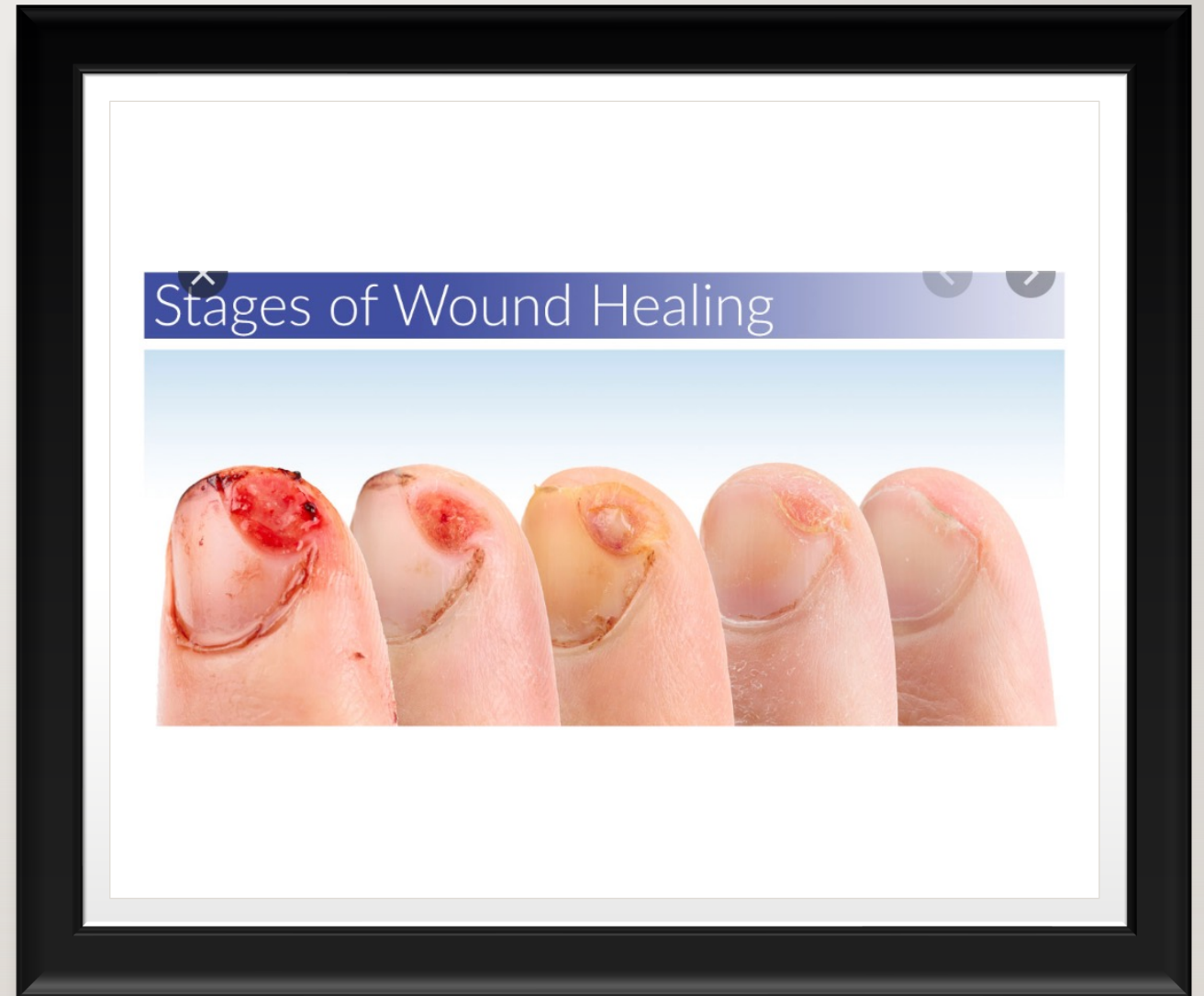
IMAGING/TESTING

- Xrays:
 - Must have adequate views
 - fractures, dislocations, pre-existing conditions
- MRI:
 - ligament injuries
- Ultrasound:
 - foreign bodies, tendon function, masses



TREATMENT

- Goals
 - Maintain circulation
 - Obtain healed wound
 - Preserve motion & function
 - Retain sensation
 - Listen to patient's goals!! ***
 - Allow adequate healing
 - Fast and safe return to work/life

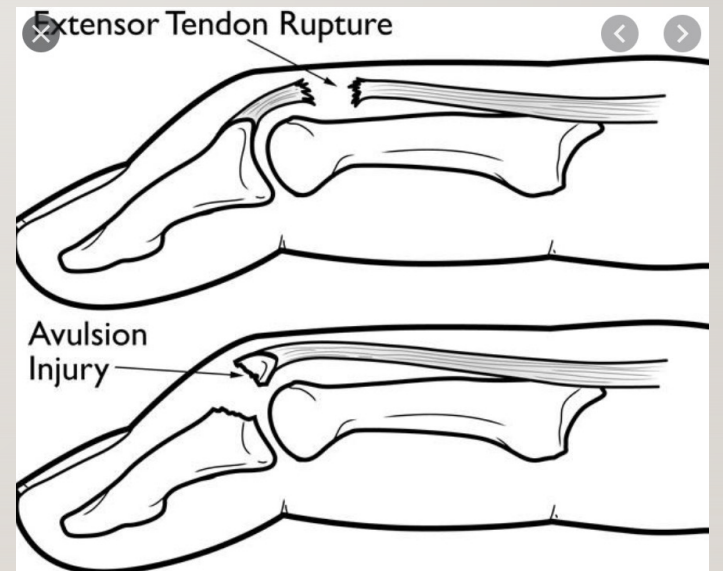
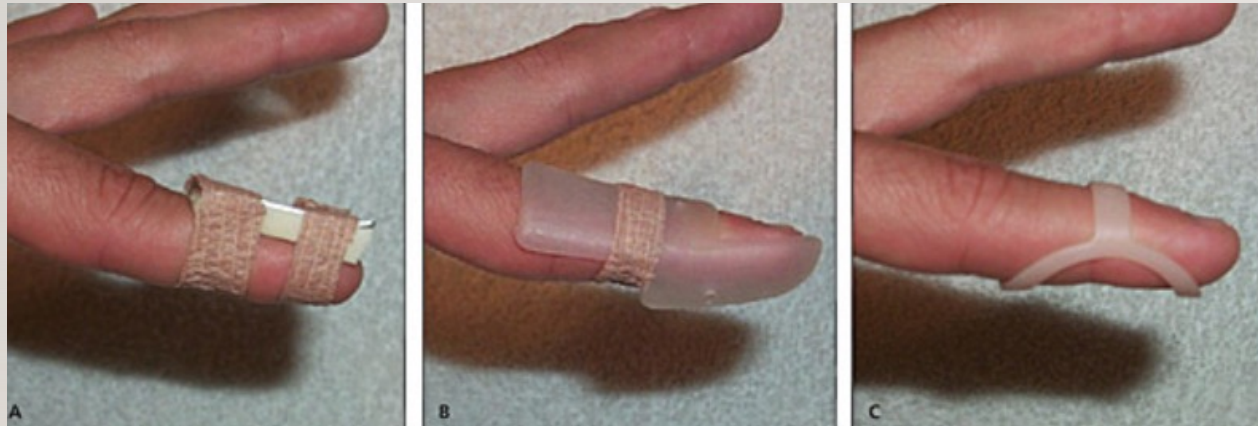
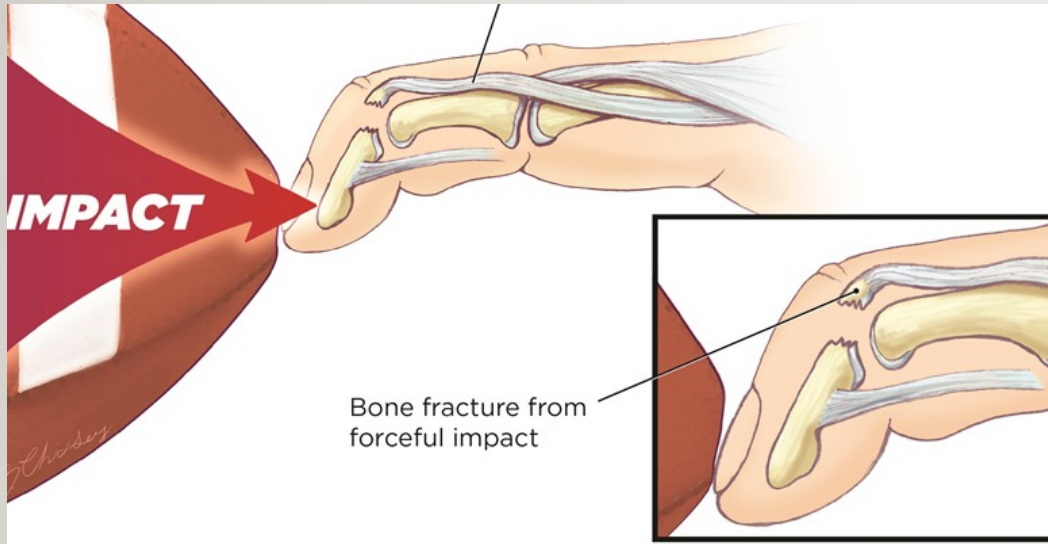




COMMON HAND INURIES

FINGER TIP

- Mallet finger
- Distal phalanx fractures +/- nailbed injury
- Amputations



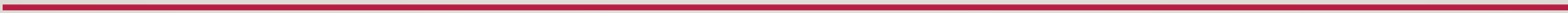
FINGERTIP LACERATIONS/AMPUTATIONS

- These are NOT surgical emergencies!
- Remove nail if needed, wash out, suture what you can (use chromic!) and dressing
- What if it is bleeding badly? Place a pressure dressing for 20 minutes, then replace with normal dressing. It will stop!
- Oral antibiotics: Keflex, Clindamycin, Augmentin (bite wounds)

TREATMENT GOALS

- Minimize pain
- Optimize healing time
- Preserve sensibility and length
- Prevent painful neuromas
- Avoid nail deformity
- Minimize time lost from work
- Acceptable cosmetic appearance

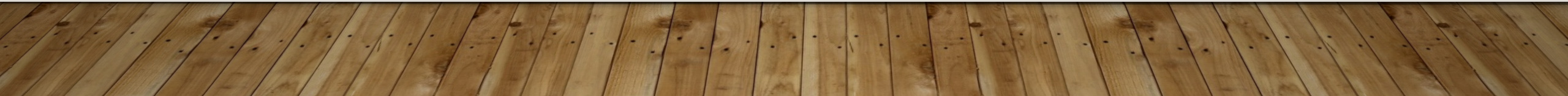




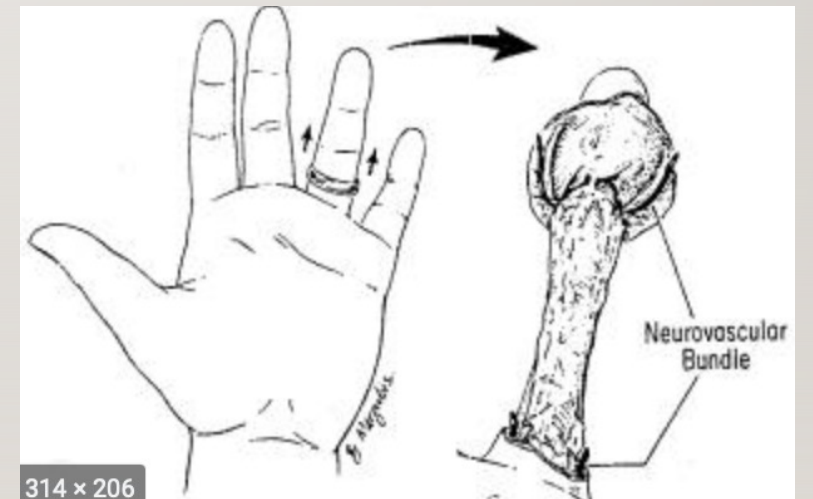
HEALING BY SECONDARY INTENTION



- I and D and Aquaphor and coban dressing
- Do not let the wound dry out
- Avoid peroxide, alcohol and Neosporin
- Takes 3-6 weeks to heal
- Sensitivity plateaus around 2 years



RING AVULSION INJURY



WEAR
SILICONE
RING OR NO
RING AT ALL



WHAT ABOUT REPLANTS?

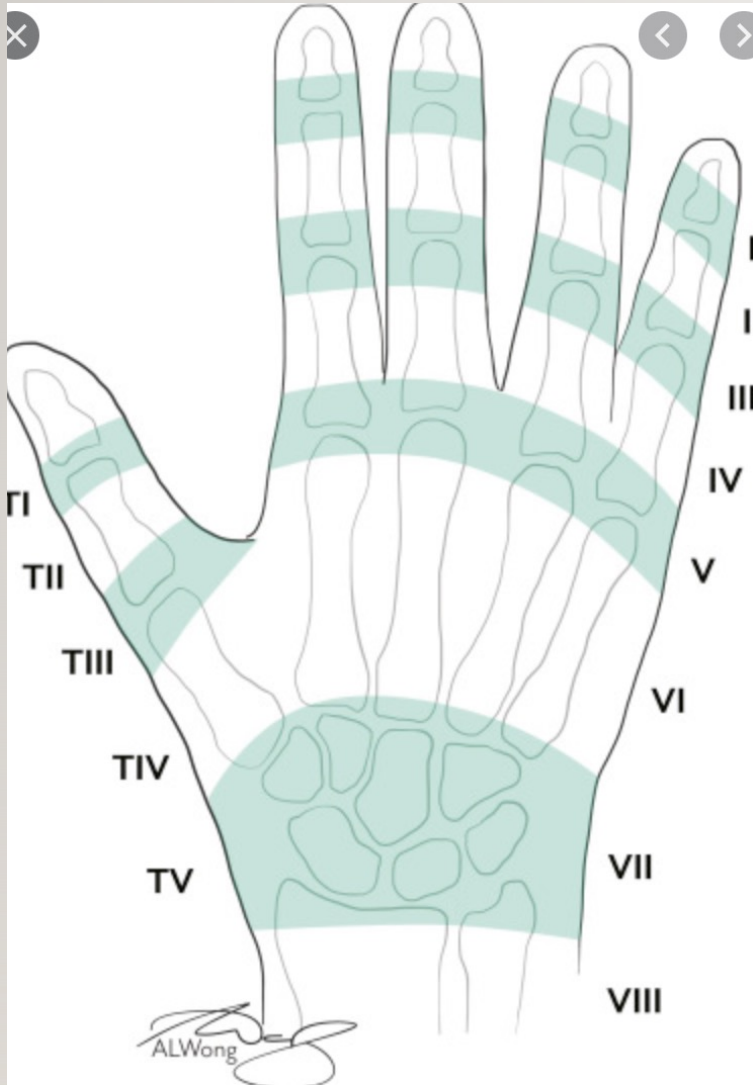
- 74% decrease in re-plant attempts over past 10 years
- Must take into consideration the patient's healthy history, occupation and wants
- Barriers to replants:
 - Require lengthy hospital stay/ICU care at times
 - Can require multiple surgeries
 - May miss months of work: average is 5 months
 - Cost: 10-15x more expensive than revision amp

WHAT ABOUT REPLANTS?

- Digit Function:
 - 20-60% decrease in motion
 - 80% of patients only get protective sensation
 - Many request later amputation
- 62.5% patients transferred via air to a level I trauma center did not have attempted replant surgery

TENDON INJURIES

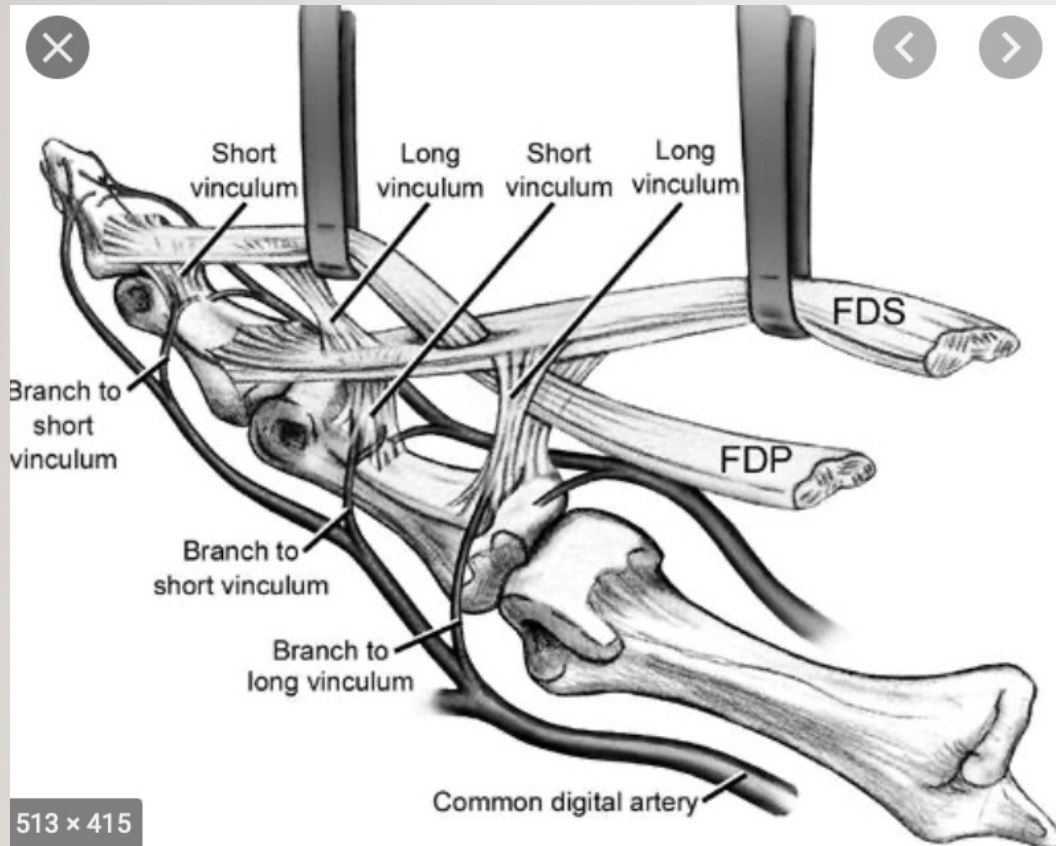
- Classified as....
 - Extensor or flexor: zones
 - Partial lacerations
 - Complete lacerations
 - avulsion
- Lacerations less than 50-60% usually do not need repair unless they go on to rupture
- Prerequisites for tendon repair:
 - Clean wound bed with healthy tissue
 - Bony stabilization
 - Adequate stable soft tissue coverage

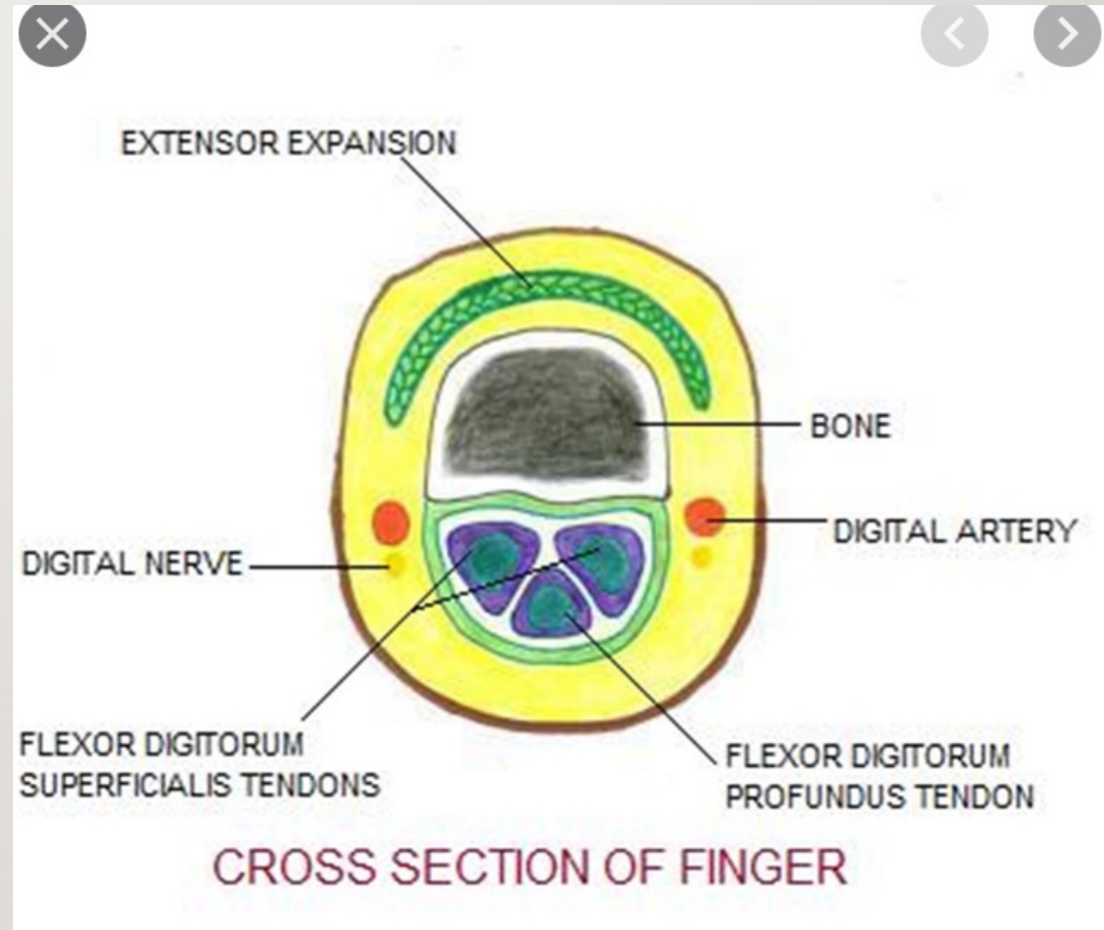
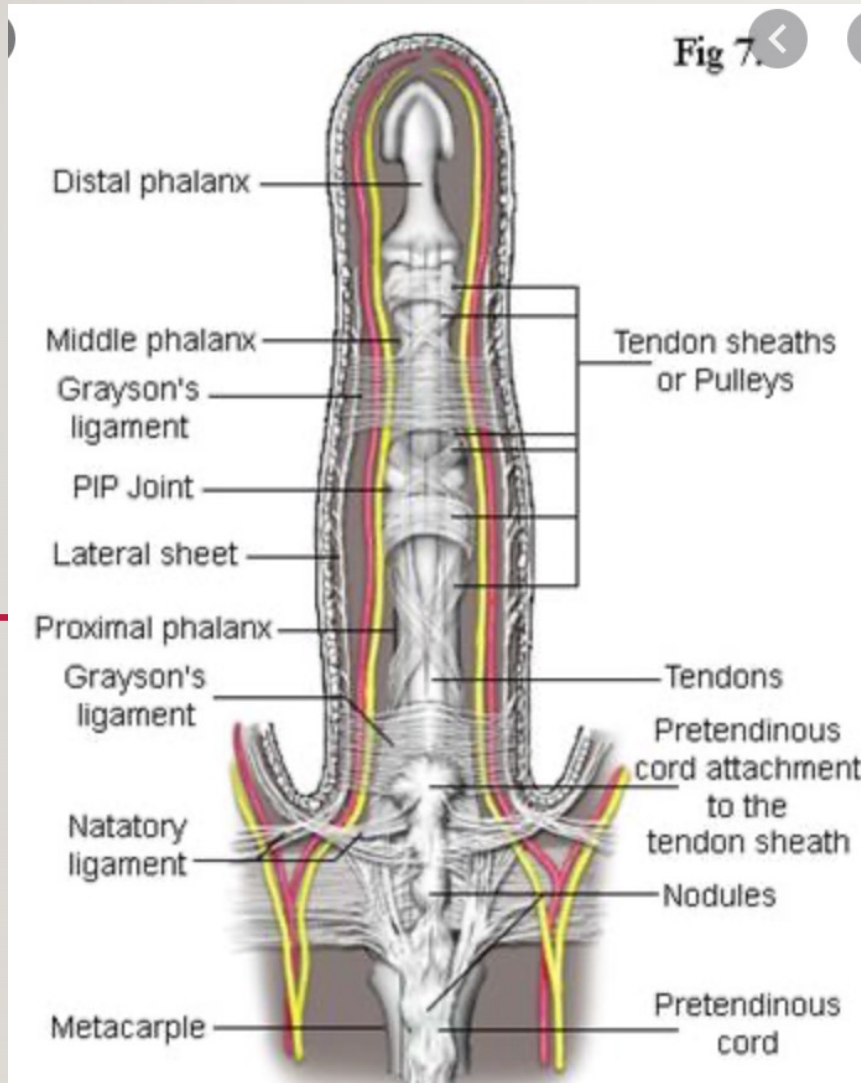


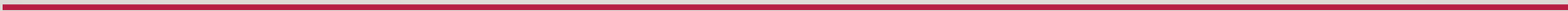
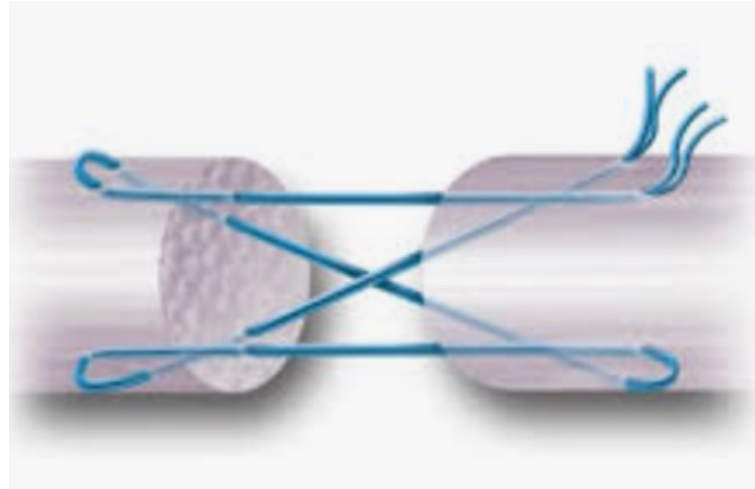
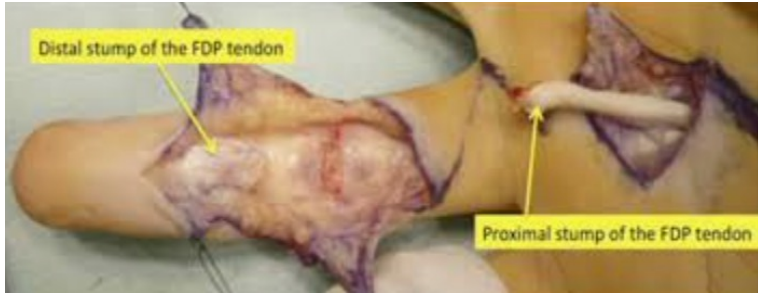
FLEXOR TENDON INJURIES

- Most commonly result from lacerations or puncture wounds on palmar surface of hand

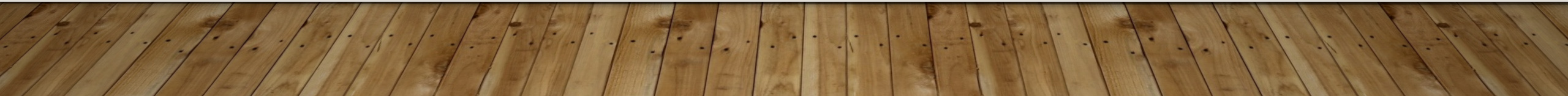
- Require urgent identification and treatment – surgery needed in 7-10 days
- Must be concerned about NV status of hand/digit with these injuries
- Divided into 5 zones
- Requires therapy splinting and protocol soon after surgery
- Requires strict patient compliance
- Downside: delayed treatment = need for staged reconstruction or not fixable
- Lengthy treatment/recovery process
- High chance for long term deficits

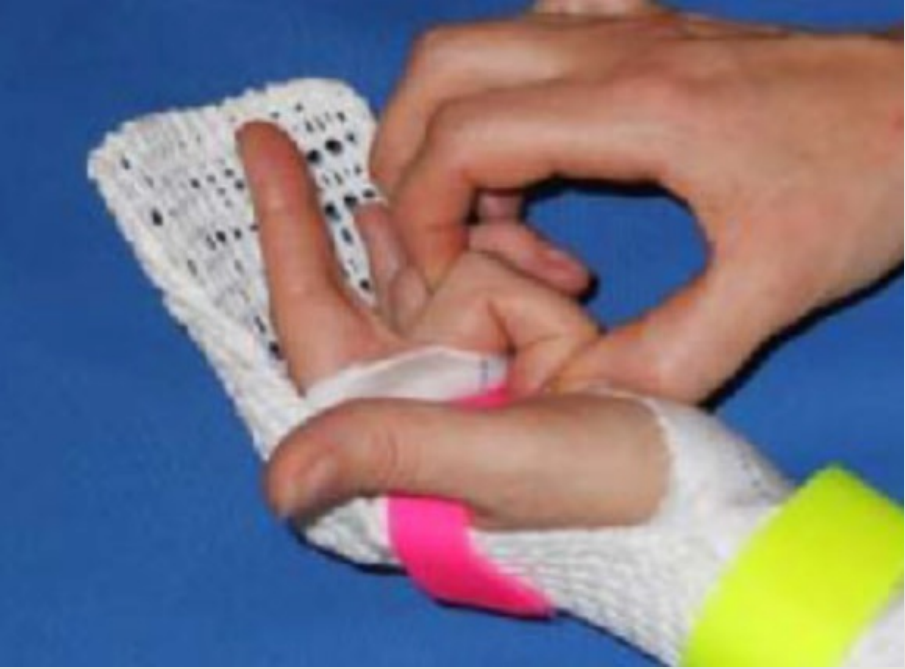






FLEXOR TENDON INJURIES ARE
WORSE THAN EXTENSOR
TENDON INJURIES





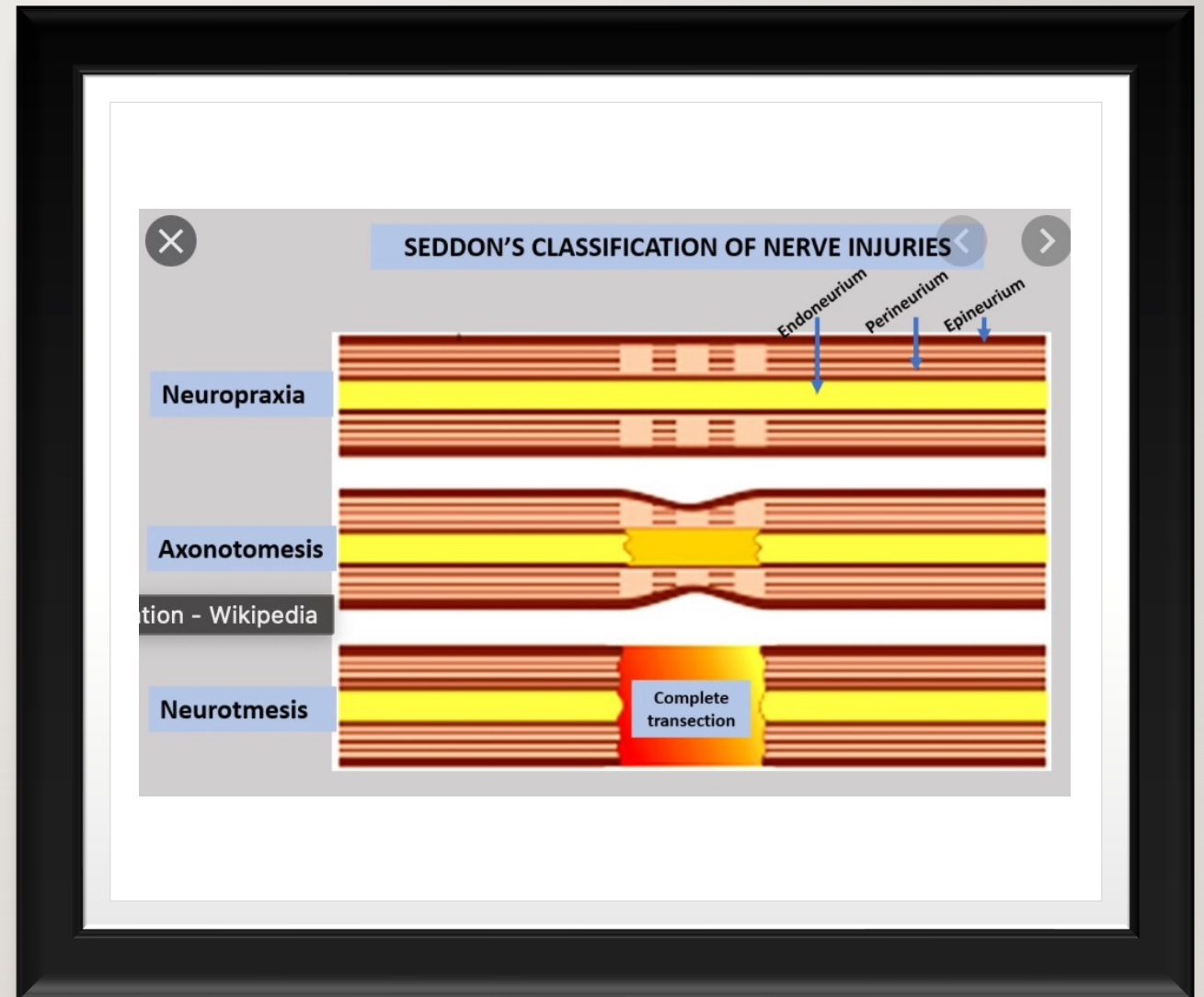
EXTENSOR TENDON INJURIES

- Direct repair needed in acute trauma if laceration is $> 50\%$
- Surgery best with 2 weeks
- Usually require splinting for 6 weeks
- Most require OT after splinting



NERVE INJURIES

- Neuropraxia: stretched nerve
 - Recovery usually in days, weeks or months
- Axonotmesis: Damaged but nerve is intact
 - Recovery with average 1-2mm/day
- Neurotmesis: complete nerve laceration
 - Needs surgical repair
 - Recovery after repair 1-2mm/day
 - 50-80% return of sensation/motor after repair (if function returns)

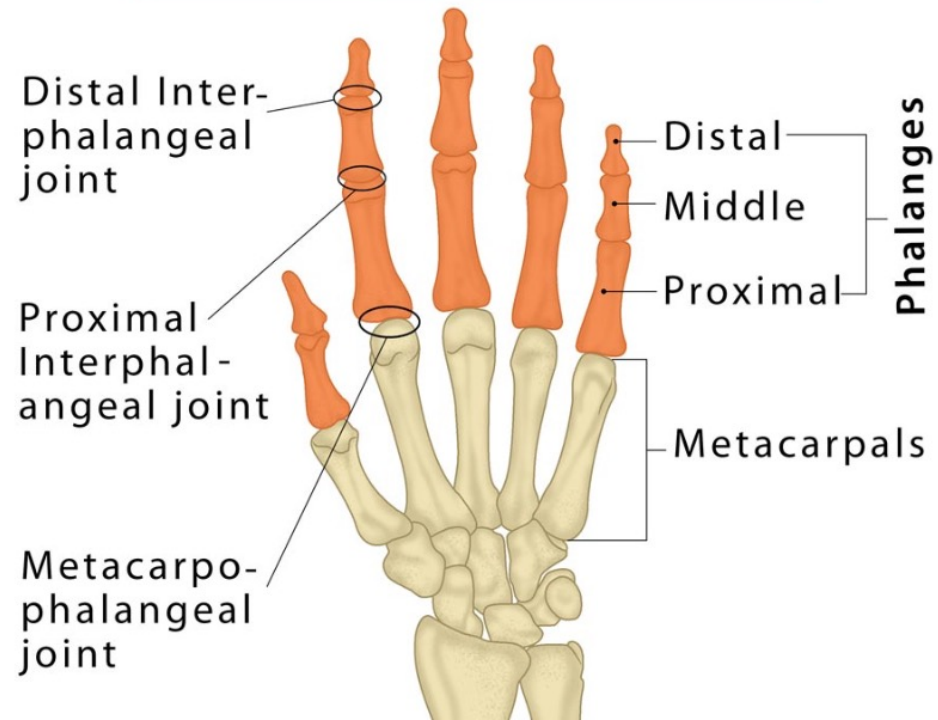


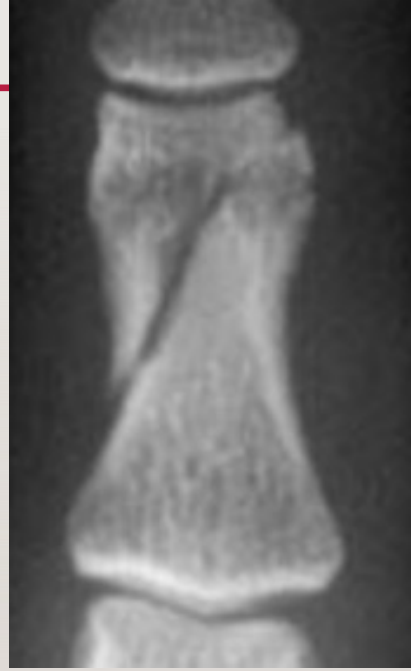
BONE INJURY

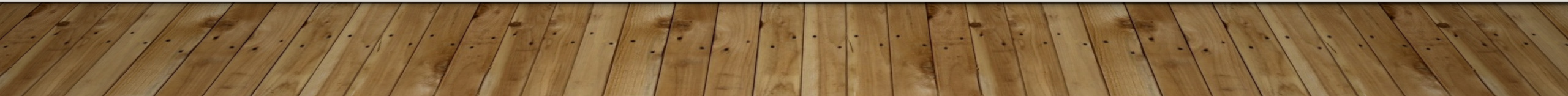
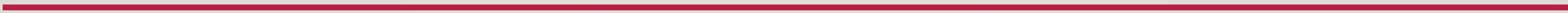
- Phalangeal Fractures
- Metacarpal Fractures
- Carpal Bone Fractures

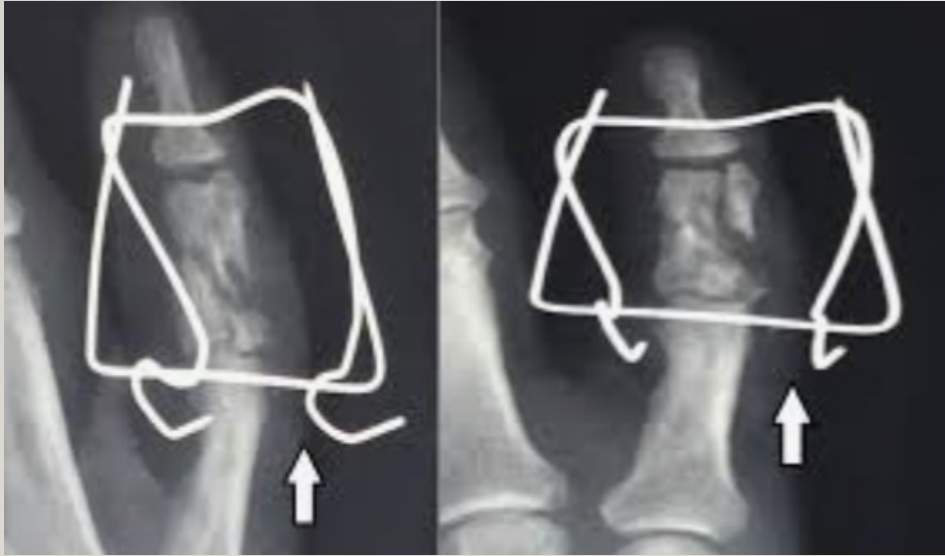
PHALANGEAL FRACTURES

✕ Phalanges of the Hand >



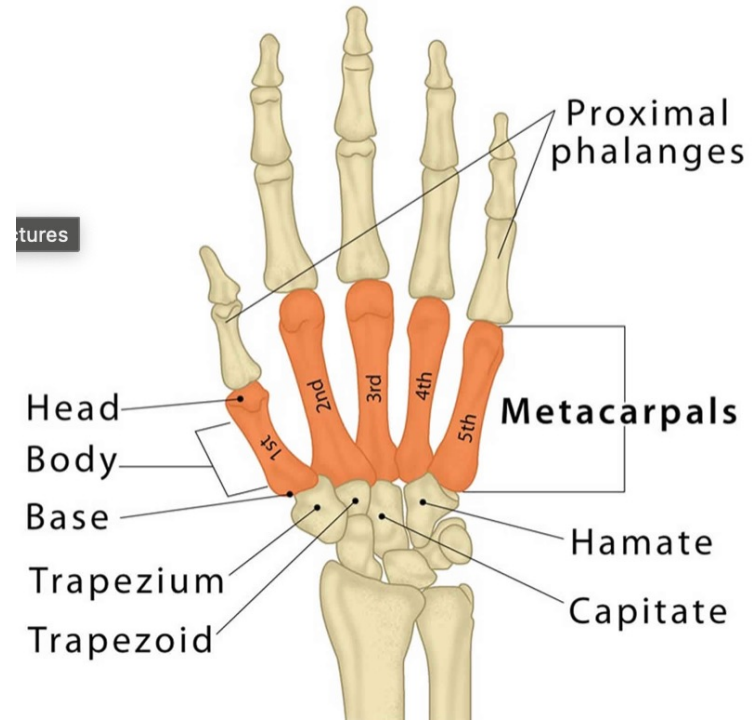


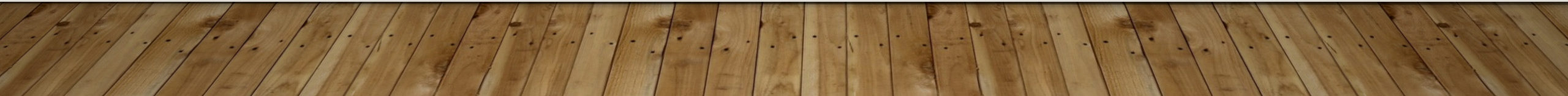
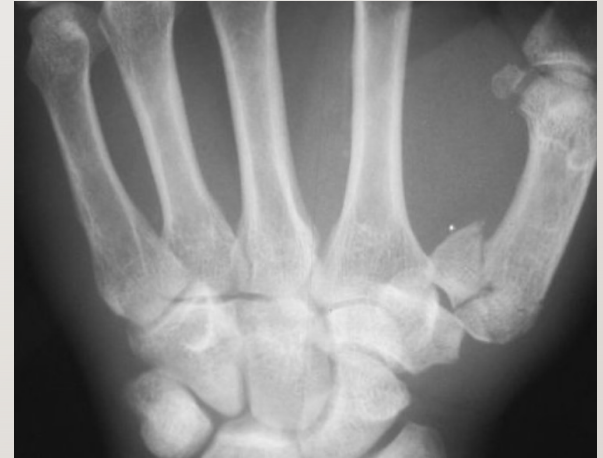


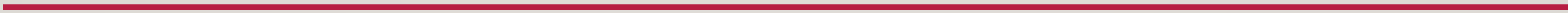


METACARPAL FRACTURES

The Metacarpal Bones









OPEN VS CLOSED

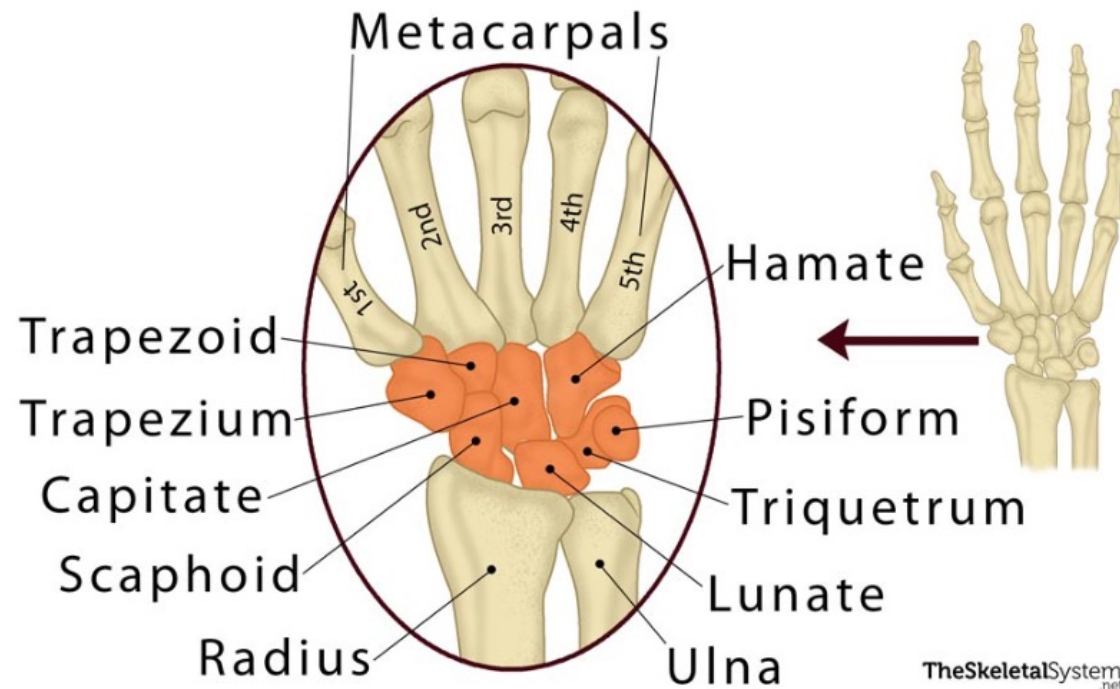
- Simple open finger/hand fractures can be washed out in the ER, given oral abx, splinted and can follow up with hand surgeon in 1-2 days.
 - Infection rate if treated urgently: 1%
 - Infection rate if treated non-urgently: 1.5%

Open finger and hand fractures do NOT equal open long bone fractures

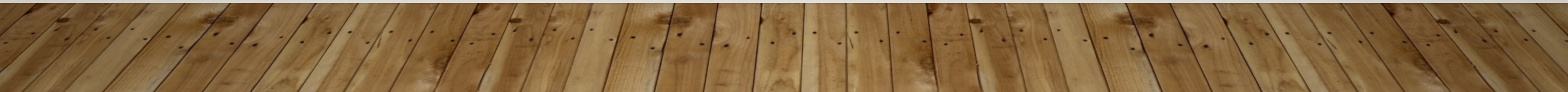
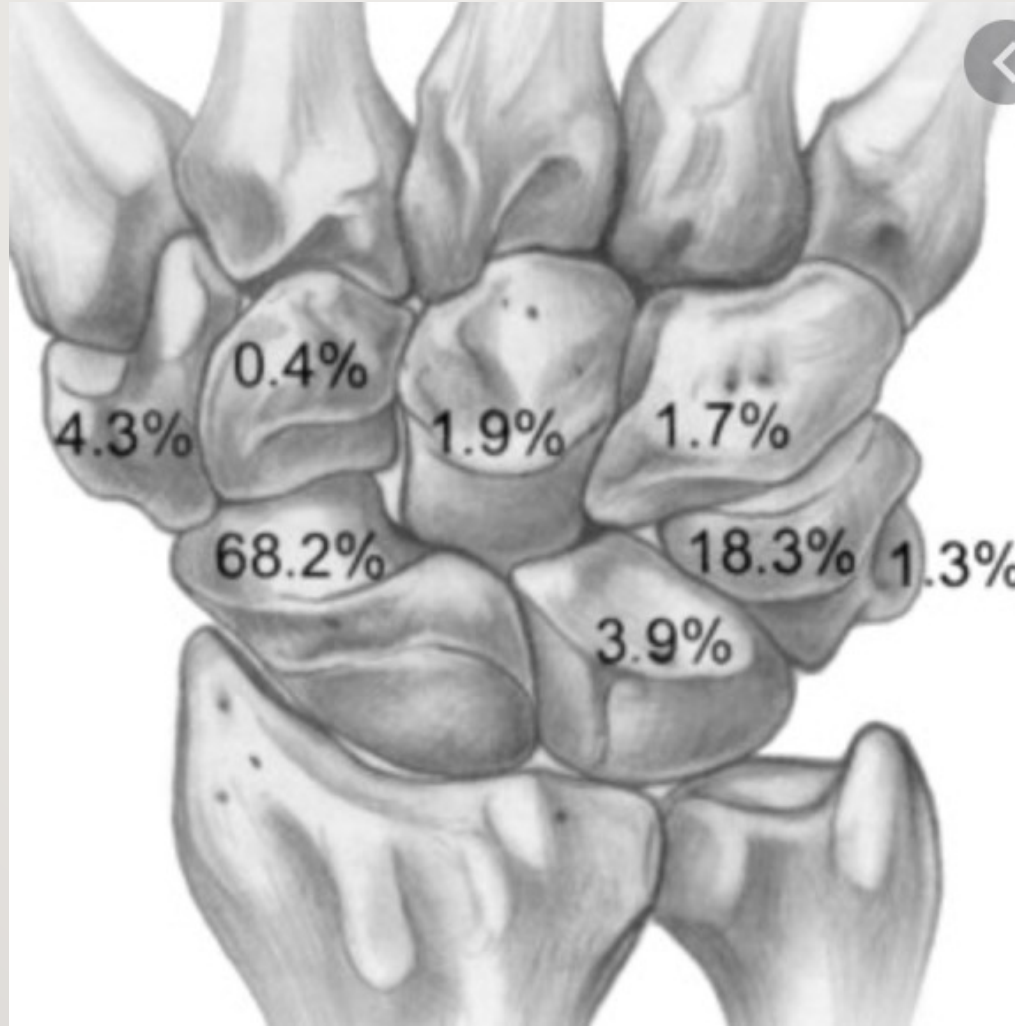
CARPAL BONE FRACTURES

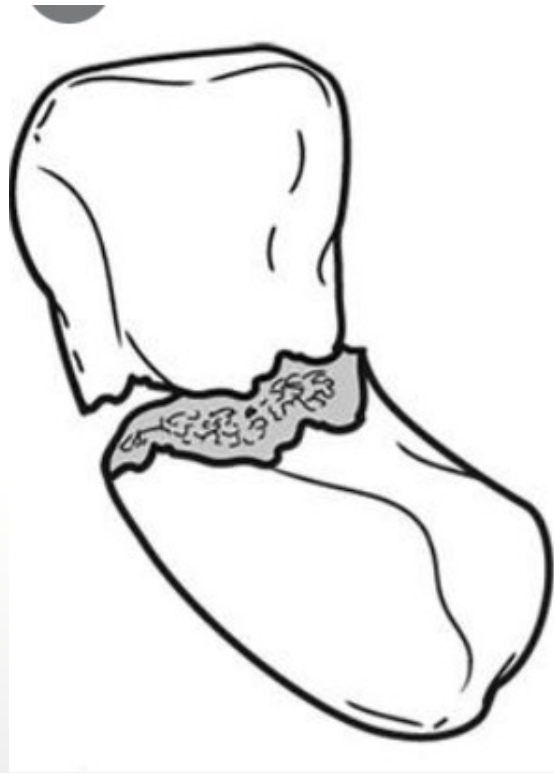


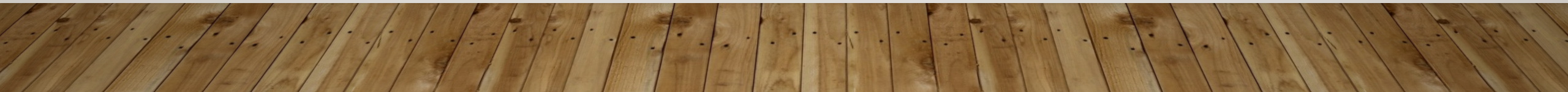
The Carpal Bones < >



TheSkeletalSystem.net



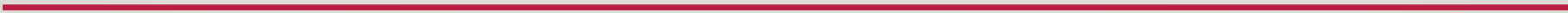
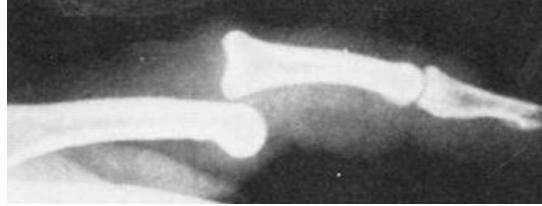
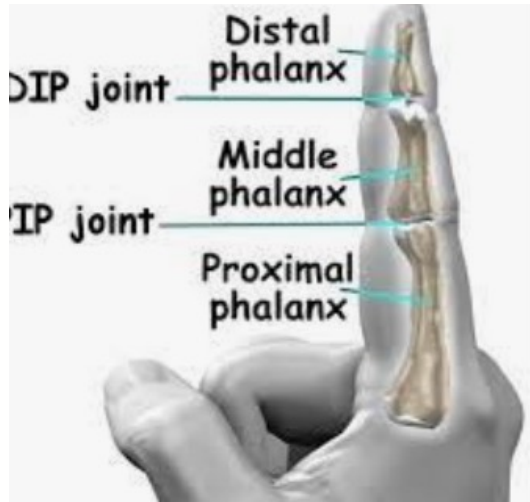


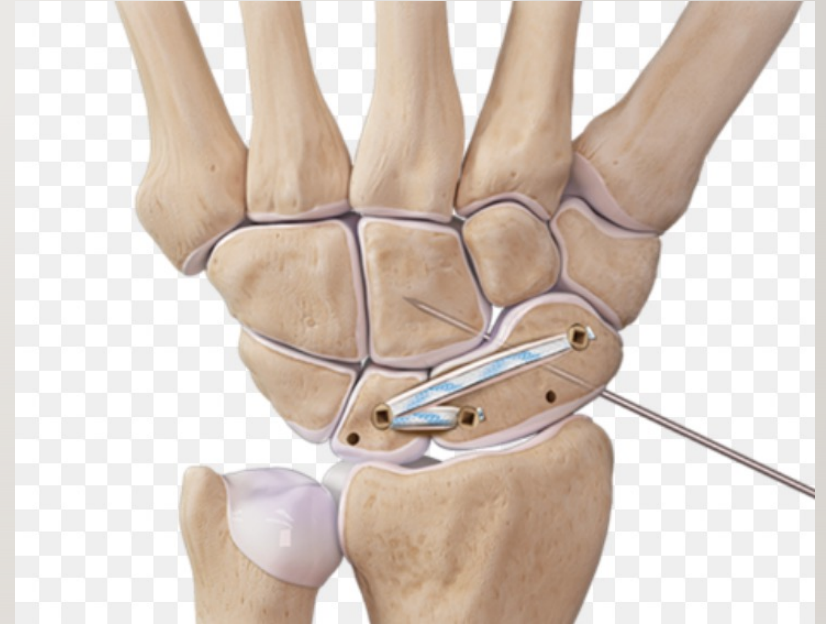
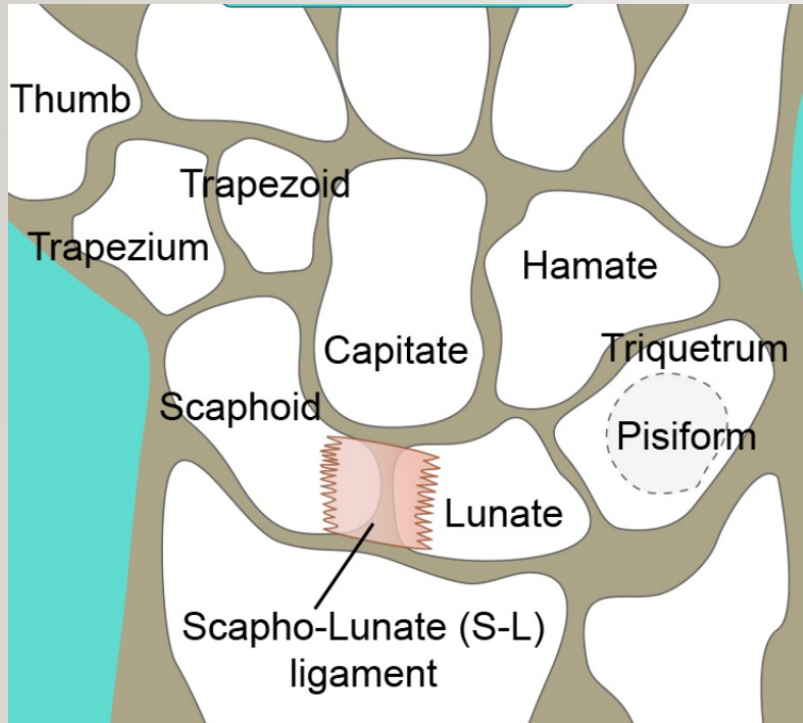




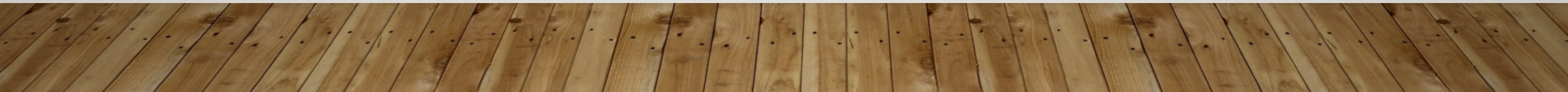
DISLOCATIONS & LIGAMENT INJURIES

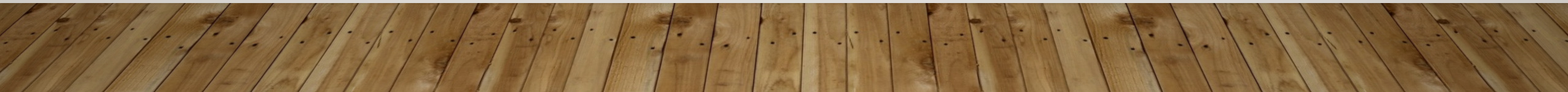
- Typically worse injury than fractures
- Take longer to heal and greater potential for long term problems compared to fractures
- Not always operative
- Sprains also fall into this category and can take a long time to get better
 - Beware of the PIP joint sprain!!

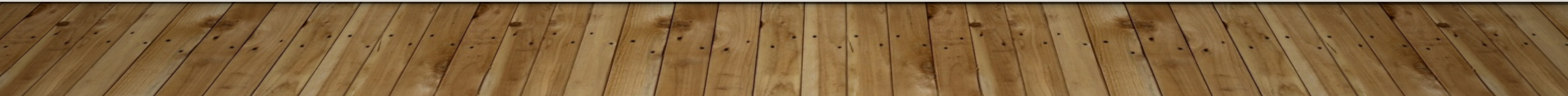












HAND INFECTIONS



ACUTE TREATMENT/EVALUATION

- Minor infections: **drain pus**, wash out, oral antibiotics, follow up
 - Felon, paronychia, isolated abscess
- More serious infections: Admit, IV abx, may need surgery
 - Bite wounds, joint involvement, Flexor tenosynovitis, large involved areas, sick patients
- Emergent: Necrotizing Fasciitis
- Staph aureus: 44%
- Beta-hemolytic Strep: 42%
- >50% are polymicrobial
- MRSA: 34-73% of all hand infections

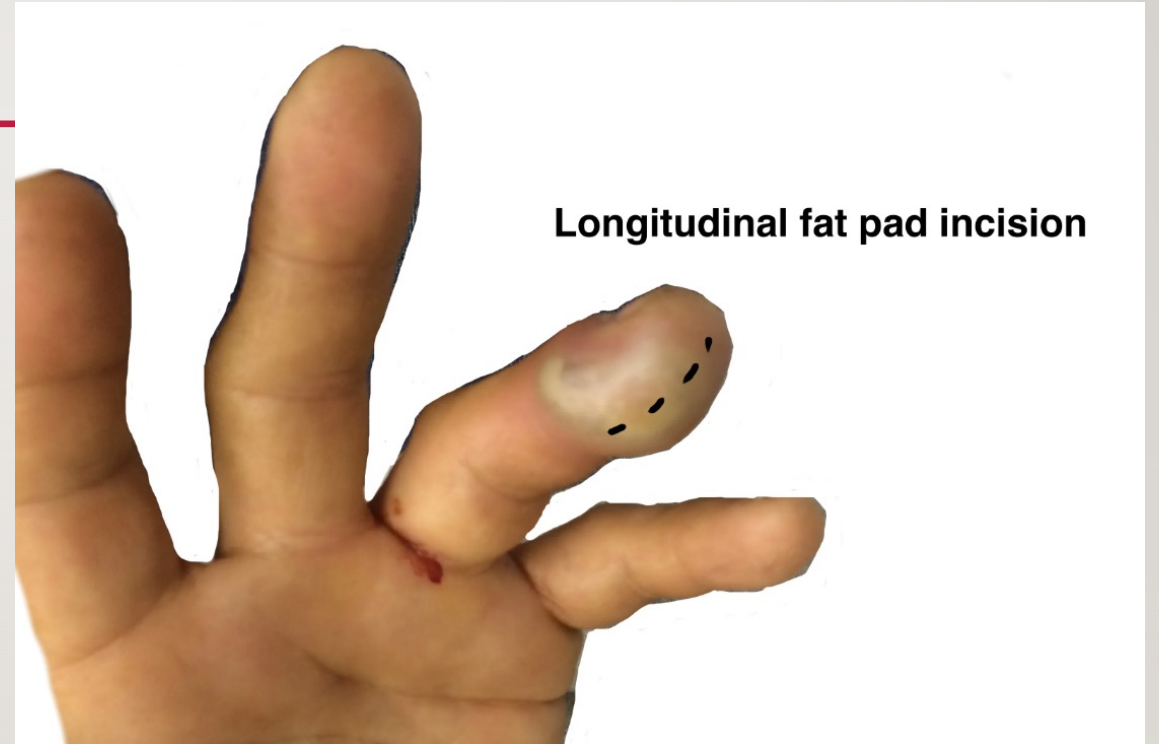
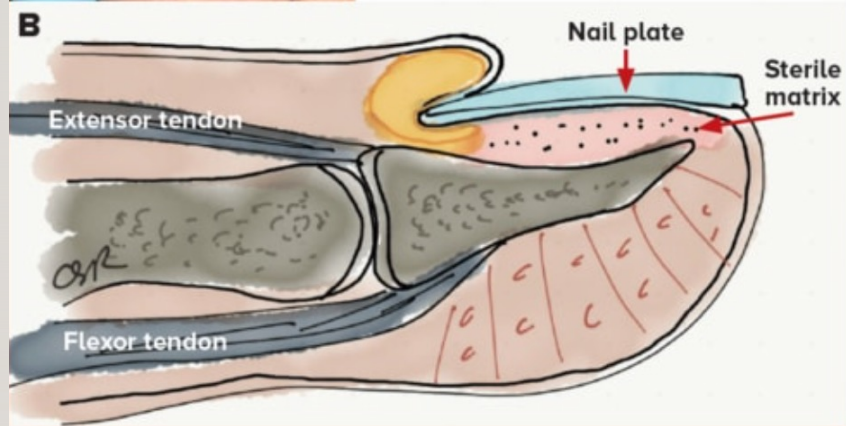
WHICH ANTIBIOTICS?

- Oral: Bactrim or Clindamycin (clinda resistance MRSA is a problem)
 - Sulfa allergy: clinda and cipro
- IV: Vancomycin, Clindamycin, Linezolid, TMP-SMX
- Bite wounds: Unasyn (IV), Augmentin (oral)
 - PCN allergy: doxycycline, Bactrim or Clinda plus Cipro/Levaquin



Figure 1

- A.** Clinical photo of a paronychia
- B.** Illustration showing pus extending below the eponychium fold



BITE WOUNDS

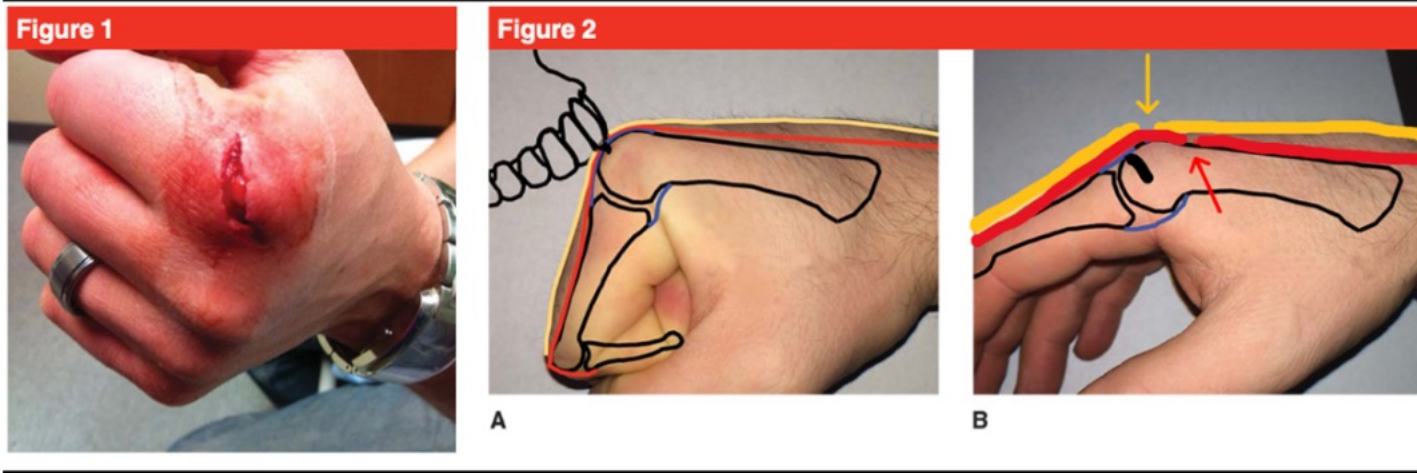


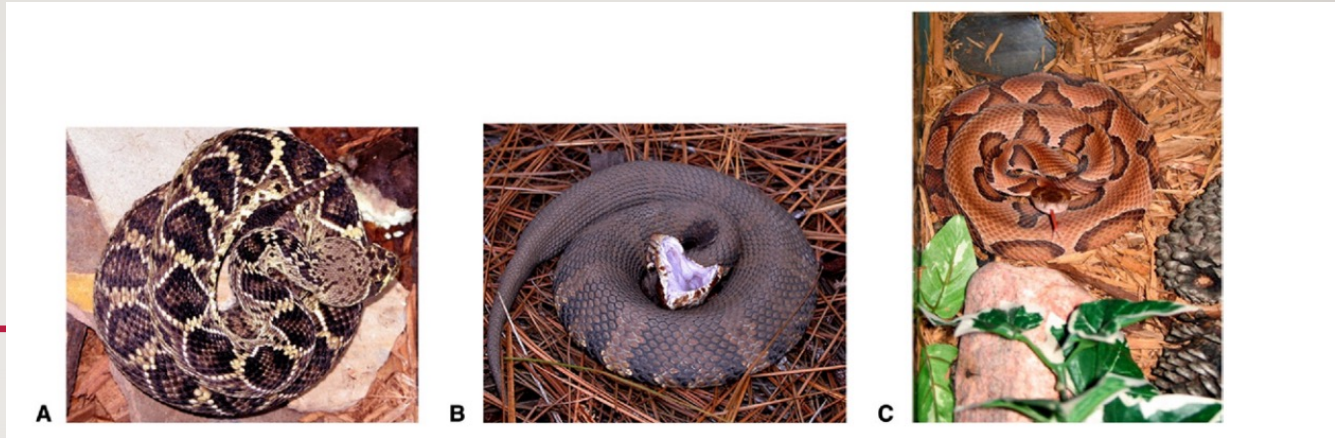
Figure Citation: Kennedy, Stephen A., Laura E. Stoll, and Alexander S. Lauder. "Human and other mammalian bite injuries of the hand: evaluation and management." *JAAOS-Journal of the American Academy of Orthopaedic Surgeons* 23.1 (2015): 47-57.





SNAKE BITES

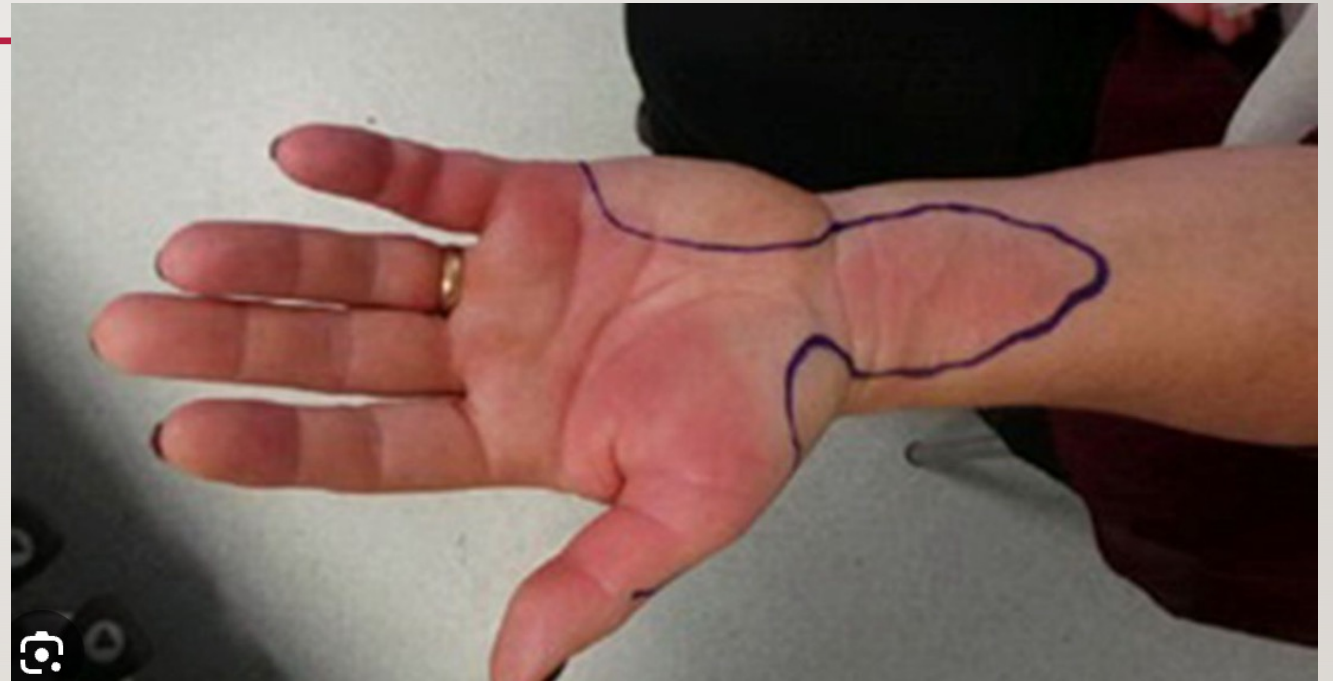
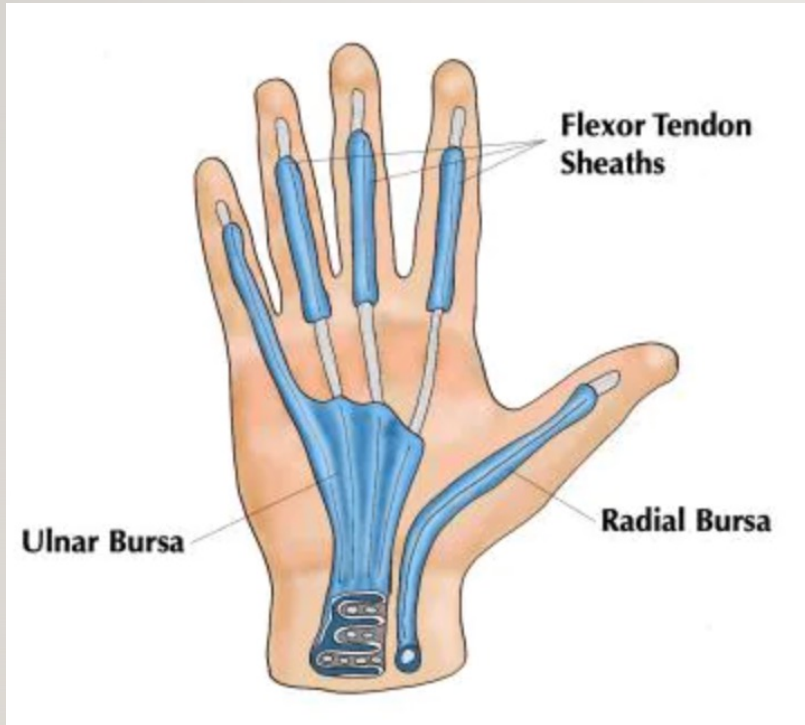
- Elevate
- Clean wounds
- Anti-venom
- Tetanus
- Abx only if infection present
- Most do not get compartment syndrome or require surgery



FLEXOR TENOSYNOVITIS

- Kanavel signs:
 - Fusiform digital swelling
 - Pain with passive extension
 - Semi flexed position
 - Tenderness along entire flexor tendon sheath to palm
- Treatment: IV abx and most need I and D





SEPTIC ARTHRITIS



BAD ACTOR: GOUT

- Can present the same way as infection
- Uric acid vs CPP (pseudogout)
- History and x-rays very important
- Uric acid labs not reliable
- Aspirate and send for Gram Stain, culture, crystals and cell count
- They improve quickly with anti-inflammatories



NECROTIZING FASCIITIS



FINAL THOUGHTS



- Everyone uses their hands
- Hand injuries can have a dramatic impact on the quality of life
- Most hand injuries can be temporized in the ER and seen as outpatient
- Recognize the bad stuff

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THANK YOU!!
QUESTIONS??

Tulsa
Bone & Joint
MOVING LIFE FORWARD.

 **Saint Francis**
Health System

