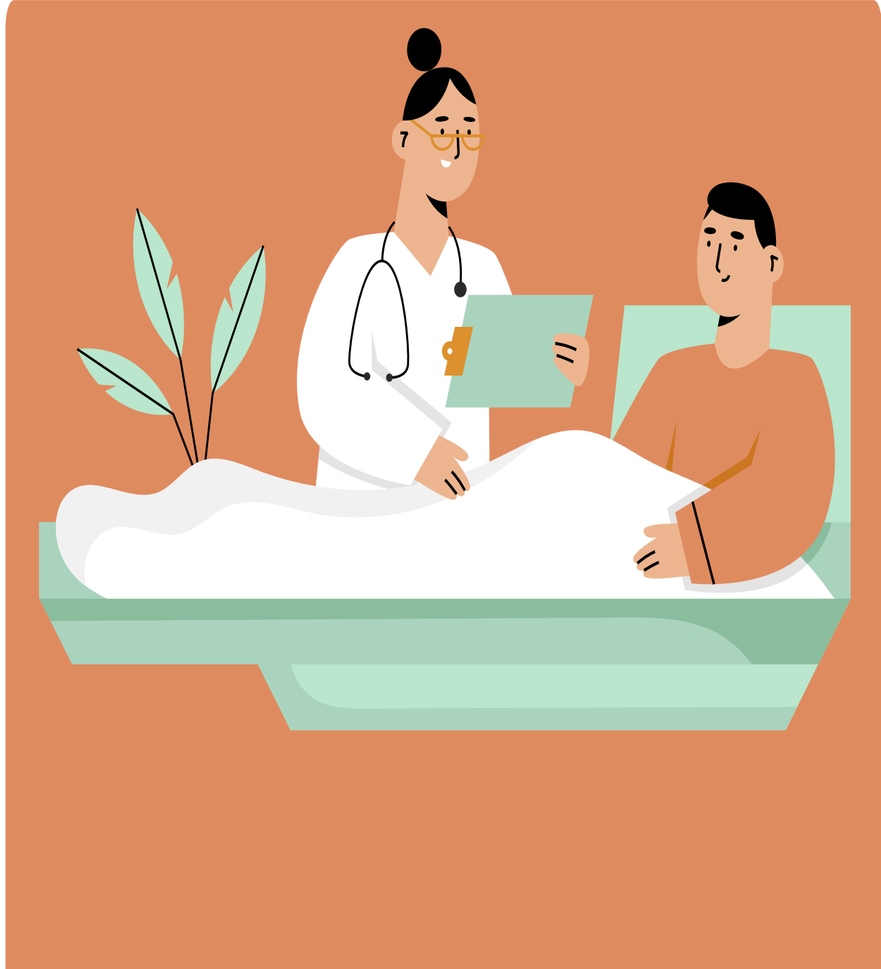
MED437
KING SAUD UNIVERSITY

SURGERY TEAM 437



Hand injuries

Objectives:
Not given

Team leaders: Alanoud Almansour, Ghaida Al Musma , Muath Alhamoud and Omar Alsuhaibani

Done by: Rahaf AlSammari, Abdulrahman Alkholaif, Fahad Alnahabi, Munira Alhadlg, Tareq Alalwan

Revised by: Yazeed Al-Dossare

Color Index:

- Important
- Doctor's Notes
- Extra
- Davidson's

Editing File / Feedback

History Taking in Hand Injuries

❖ History: 5 Important Questions

Age	
Hand Dominance	Why is it important? Both hand dominance and occupation are important to know the effect of this injury on his lifestyle and function.
Occupation & hobbies	For example a banker; his only work is to sign papers if he injured his hand work will be affected.
Previous hand trauma or injury	For example someone came in with a previous hand fracture that wasn't discovered and broke it again, you try to fix it but you can't fix it properly he'll blame you because you didn't ask about previous surgeries. If Someone has deformity in their hand or broke it 3-4 times before, It'll make the repair "**fixation**" of the fracture or injury more complicated . If someone has a cut in his nerve and you didn't check the sensation and document it he'll blame you that you made him lose the sensation after surgery.
Smoking	Important in replantation procedure.**Nicotine causes vasoconstriction and decrease healing** ,so his surgery will be a waste of time as it won't be successful Some doctors consider SMOKING as a relevant **contraindications** for major surgery and sometimes for cosmetic surgeries.
Tetanus	Ask the patient if he took the vaccine (It's valid for 5-10 years), if not give him the vaccine to prevent them from tetanus infection.
Past medical history (RA, OA, DM ...)	

In the end how to present your case (OSCE): A 25 yrs old right handed student, no previous injuries, he smokes 5 cigarette per day, took his tetanus vaccine.

❖ Acute vs. Chronic 1- main complaint 2- duration 3- example

Acute hand injuries	Chronic hand injuries
1. They'll present with pain. 2. 2 hours and he'll be in the **ER**. 3. Trauma, Burns, Laceration, wounds, fractures, Infection, artery cut, vein cut, nerve cut, dislocation.	1. They'll present with long-term pain. 2. 6 months and they'll be in the clinic. 3. Long term dislocation, arthritis, long term tendon cut, long term numbness, trigger finger. **MOST COMMON** examples: Carpal tunnel syndrome, lumps (Ganglions, Lipomas)

❖ Mechanism of Injury and Complaint

How did this problem happen?

- Examples: I was running/ playing football (**fracture**). I was cutting in the kitchen (finger cut or nerve cut), I was in a car accident (**Dislocation**).
- Lump? How long? Where? Change in size? Pain? Pressure? Discoloration?

The rest of the history is the same as any other history so in your OSCE,
if it's pain ask about history of pain, if ulceration ask about history of ulceration ...

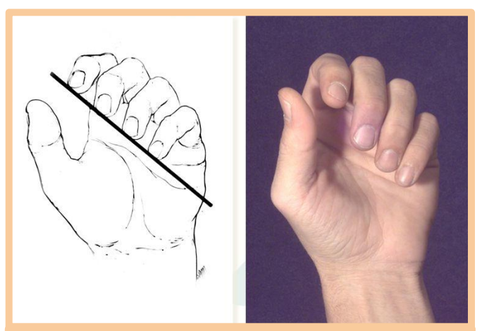
Hand Examination

What is the 1st thing to do before examining the hand?

- VITAL SIGNS, For example someone came in with acute pain in his right hand, vital signs shows (Temperature 39, Pulse 150, BP 60/20) what does that mean? Serious **INFECTION** causing sepsis!
- Most common cause of bad hand infection? Necrotizing fasciitis, it is very fatal.
- Examine from out to in : skin > soft tissue > tendon > artery > nerve > veins > bone

1. Inspection:

- Compare two hands. Compare right and left and always compare to a normal hand
- Dorsum and volar (palmar) surface: in OSCE they'll provide you with a picture of the dorsum of the hand, don't forget to ask for the palm picture!
  - Skin (ulcers, lesions or color). A cut in the artery will make the skin pale acutely, if a couple of days passes it would become black (necrotized)
  - Swellings
  - Muscle wasting motor nerve injuries would cause the wasting, a chronic process
  - Position Normal position of the hand "Muscle tone" at complete rest is called the **Flexion cascade** (flexor tendons are STRONGER than extensors so if there is a **cascade impairment** it will mainly be due to flexor tendon injury)



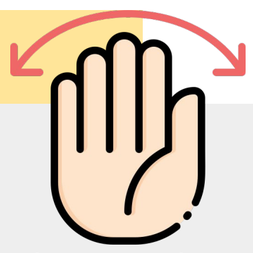
Normal flexion cascade

Abnormalities due to tendon cuts

2. Palpation:

- Feel for: tenderness, sensation, (Pain, Pressure, Light touch and Vibration) vascularity, tendon movement, temperature and capillary refill. Capillary refill is fast in vein cuts while low in arterial cuts, normal cap refill is 2-3 seconds.

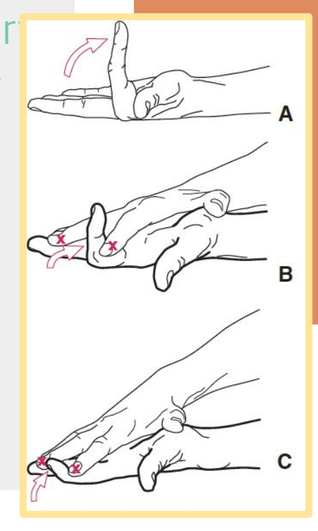
3. Move range of motion (ROM)



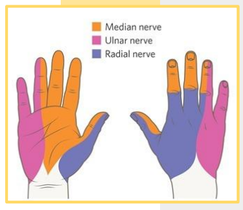
- Active and passive movements:
- Examine FDS, FDP, & extensor tendons
  - Adduction & Abduction : Hands has **8 flexor** tendons and dorsum has **12 extensor** tendons, some are intrinsic (origin and insertion in hands) others are extrinsic (origin in the forearm insertion in the hand to move the hands and fingers)

What's the normal position of the hand when you put it on the table relaxed?

If the fingers are flexed; it means that the flexor tendons are stronger than the extension tender "fingers cascade". The cascade depends on the tone of the tendon so even when you cut the ner you will still have a good position even though you cannot move the fingers. So when cutting the nerve alone you won't lose the cascade but you will lose the active movement.



- Specific nerve test: (Sensory + motor)
  - Median[1] supplies 3 and a half digits on palmar side.
  - Ulnar supplies one and a half digit in both directions "dorsum and palmar sides"
  - Radial supplies 3 and a half digit on dorsum side.
- Special nerve compression tests: Phalen's test, Tinel's test, Allen's test.



1| The muscles of the hand supplied by the median nerve can be remembered using the mnemonic, "LOAF" for Lumbricals 1 & 2, Opponens pollicis, Abductor pollicis brevis and Flexor pollicis brevis. (NB: OAF are the thenar eminence)

Hand Infections

Paronychial infection | Felon | Herpetic whitlow | Collar abscess | Flexor tenosynovitis | Hand bites | Necrotizing fasciitis

Paronychial infection

Paronychial infection: "nychia is nail and paro is the infection of the surrounding"

- **Most common hand infections** Why? Because people bite their nails and the mouth is dirty.
- **Terminology**: Paronychia? Around the nail. Hyponychium? Below the nail, perionychium? On the side & eponychia.
- **Organism**: Staph aureus.
- **Treatment**:
  - Early "acute": Antibiotic and socking finger in warm water and salt and ask the pt to keep his finger up 48 hrs and it improve.
  - Late "chronic": (Abscess development) incision and drainage (IND). Chronic cases might need intervention. Someone comes after a week and it's very swollen.
- **Chronic infection (recurrent infection):** someone present after a really long time 6 months to one year you have to rule out immunocompromised diseases and make sure there are no fungal infection.
  - **Cause**: Fungal infection "Candida" common in the immunocompromised
  - **Treatment**: Sometimes you have to remove the skin clean and then graft.

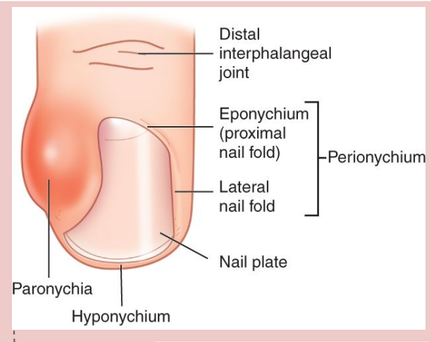
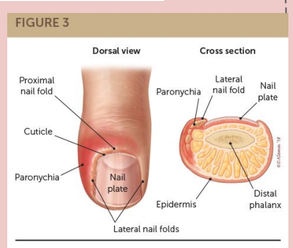


FIGURE 2

Acute paronychia is characterized by the rapid onset of erythema, edema, and tenderness at the proximal nail folds.

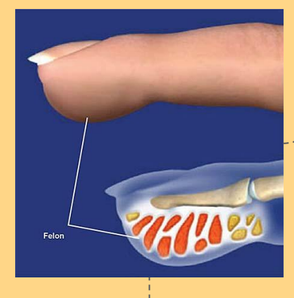
FIGURE 3



Anatomy of a finger with paronychia.

Felon

- **What is Felon?** Infections of the fingertip pulp.
- **Why the area is special?** Very tight because a lot of fibers holds the skin to the bone, very sensitive because it has many nerve endings, 2 point discrimination is maximal at this area, fingerprints. "Normal 2 points discrimination is 2 mm in this area"
- **What happens in case of an infection?** Swelling in a very tight area causes nerve compression VERY SEVERE PAIN!
- **Treatment**:
  - **Early**: Antibiotic and soaking finger in warm water and salt + Analgesia
  - **Late** or **AB didn't work**: incision and drainage, (Hockey stick incision) Incision must be made from the side to avoid distal digital nerve and lose sensation, we don't want to make a scar on the pulp of the finger because the patient won't be able to do anything and he will suffer in his life.



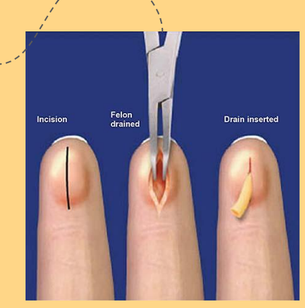
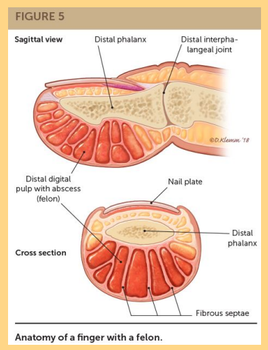


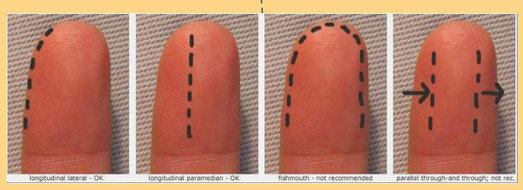
FIGURE 4

Felon of the fingertip. The patient presented with three days of increased swelling, redness, and severe pain of the fingertip.

FIGURE 5



Anatomy of a finger with a felon.



Hand Infections

Paronychial infection | Felon | Herpetic whitlow | Collar abscess | Flexor tenosynovitis | Hand bites | Necrotizing fasciitis

Herpetic whitlow

- **What is Herpetic Whitlow?**
  - HSV1 vesicular eruption of the fingertip.
- **Presentation**: Very painful small vesicles on fingers that contain clear fluid. Extremely itchy.
- **Who's more prone to get this infection?** Dentist or children who bite their nails
- Very contagious (a dentist will need to stop working until treated atleast 10-14 days)
- **Treatment**: Analgesic, Acyclovir and isolation. NO I&D

Collar abscess

- **What is Collar abscess?** Abscess of the hand web-space (can disseminate to the palm and forearm)
- **Hand spaces**: There are 10 potential spaces.
- **Presentation**: Very painful web-space, redness, swelling and abducted fingers (cannot close their fingers which is a characteristic feature)
- **Treatment**:
  - **Early**: Antibiotic and soaking finger Analgesia.
  - **Late**: (Necrosis development "could be a smoker and things get even worse") incision and drainage and then reconstruction. Do CT and MRI to make sure there's no extension .

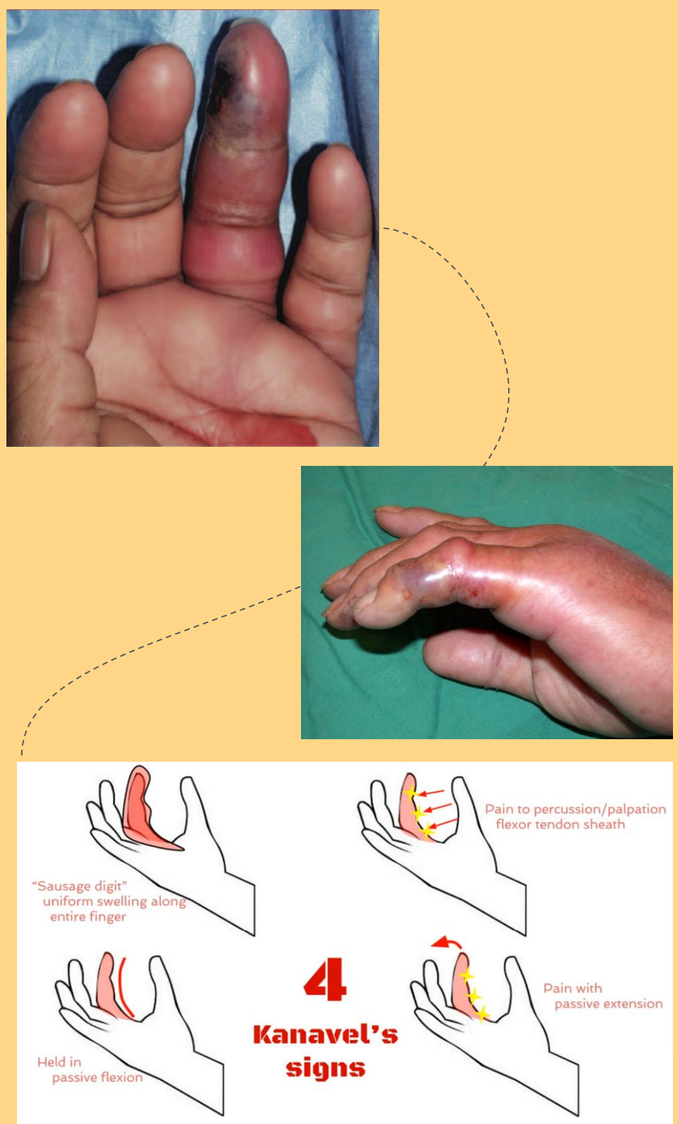
Flexor tenosynovitis [2]

- **What is Flexor tenosynovitis?** These patients must be admitted
  - Infection of the flexor tendon and the synovial sheath.
- **Presentation**: **4 signs (very diagnostic)**

1- Sausage-shaped fingers due to the swelling
2- Flexed position
3- Pain with passive extension
4- Tenderness along the tendon.

It's a very serious infection, it develops early and can get worse, it can progress up to losing the finger. No specific risk factor : (Diabetics - kidney diseases - Mosquito bites sometimes)

- **Treatment**: IMMEDIATE high risk of sepsis, necrosis and amputation!
  - Antibiotic and analgesia with Admission & observation for 24hrs
  - After 24hrs of AB and no response? Intervention incision and drainage, Catheter irrigation with saline.
  - If there is too much infection open and clean leave it open, close it later.



2 Each finger has 2 flexor tendons: https://www.youtube.com/watch?v=-IlfWZqo-Mk
(IMPORTANT IN OSCE YOU SHOULD KNOW HOW TO DIFFERENTIATE WHICH ONE IS INJURED)

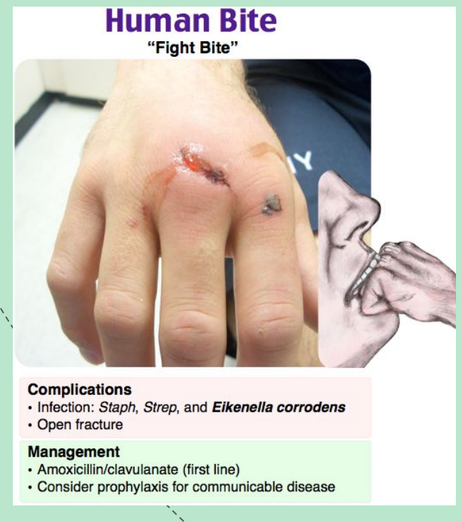
- FDS: attached to the middle phalanx and moves the PIP
- FDP: attached to the distal phalanx and moves the DIP

Hand Infections

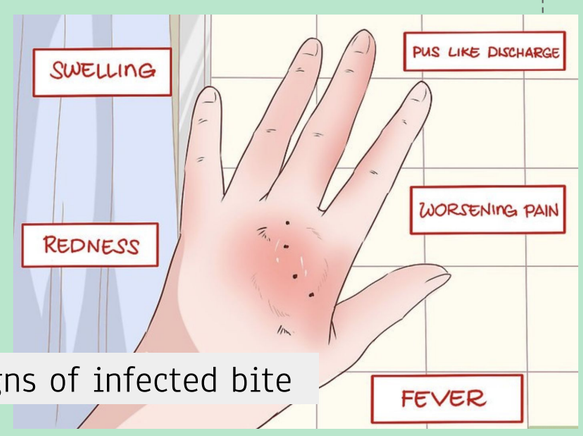
Paronychial infection | Felon | Herpetic whitlow | Collar abscess | Flexor tenosynovitis | Hand bites | Necrotizing fasciitis

Hand bites

- What is the problem with hand bite? Saliva is full of bacteria
- "Human bites" How would it happen? Punching someone in mouth, teeth penetrates and go to the joints causing septic joints.
  - **Human bite treatment**: First take a swab for culture and start them on antibiotics. open incision go under the tendon inside the joint irrigate and clean the joint.
- **Organisms**:
  - **Human bite**: Staph, strep, eikenella
  - **Dog bite**: Pasteurella Multocida (very dangerous) most common, Staph, Strep All must get rabies treatment: IgG and rabies vaccine (5 injections in abdomen at day 1,3,7,14,28)
  - **Cat bite**: Pasteurella Multocida, More dangerous (sharper+longer teeth) and they usually bite the wrist which may injure the median nerve.
- **Treatment**
  - All of them should be admitted for IV antibiotics
  - Antibiotic tetanus booster or rabies shots
  - If no response incision and drainage. (don't wait for the antibiotic 1st thing I&D then give)
  - Major issue in hospitals doctors close the wound cosmetically patients comes in after 2-3 days with frank pus and abscess formation. (it's dangerous it can be progressed to be develop Necrotizing fasciitis) .In a hand bite, never close the wound.



Infected Cat bite



Signs of infected bite

Necrotizing fasciitis

- What is Necrotizing fasciitis? Flesh eating disease of the soft tissue. Occurs in diabetics with low socioeconomic status
- Presentation: Very sick people (hemodynamically unstable fever low pressure high pulse), The Fascia involvement is way more bigger the injury size, which skip skin lesion (the diagnostic feature).
- Who's in risk? Immunocompromised
- **Organism**: Caused by Group A Beta-hemolytic strep (most common)
- **Treatment: EMERGENCY if you don't treat them acutely they might die!** Needs extensive debridement and IV Antibiotics So stabilize the pt, take him to the OR, and open all of the infected area in which the fascia will look gray with a bad smell. Once you see a healthy area > skip and open again to make sure that there's no extension.Some patients don't respond to the 1st or 2nd debridement > amputation!

Early stage

Advanced stage

Critical stage

Flexor tendons

Common injury here in saudi arabia specially during Hajj season.

ANATOMY : You need to know how to examine the tendons!

There are 8 muscles with almost 12 tendons in the flexor side (4FDS , 4FDP , FPL, FCU,FCR, PL)

	Flexor digitorum Profundus	Flexor digitorum superficialis	Flexor pollicis longus	Flexor carpi ulnaris	Flexor carpi radialis	Palmaris longus
Origin	upper 3/4 of the anterior and medial surfaces of the ulna	Medial epicondyle of humerus	Medial epicondyle of humerus	Medial epicondyle of humerus	Medial epicondyle of humerus.	Medial epicondyle of humerus
Insertion	Distal phalanges of digits 2-5	Middle phalanges of digits 2-5	Base of distal phalanx of thumb	Pisiform bone hook of hamate bone and 5th of metacarpal bone.	Base of the 2nd & 3rd metacarpal bones.	Distal half of flexor retinaculum and palmar aponeurosis
Nerve	Median nerve & ulnar	Median nerve C7 C8 T1	Anterior interosseous nerve from Median C8 T1	Ulnar nerve C7 C8	Median nerve C6 C7	Median nerve C7 C8
Movement	Flex DIP joint	Flex PIP joint	Flex thumb	Flex the wrist	Flex the wrist	Flex the wrist

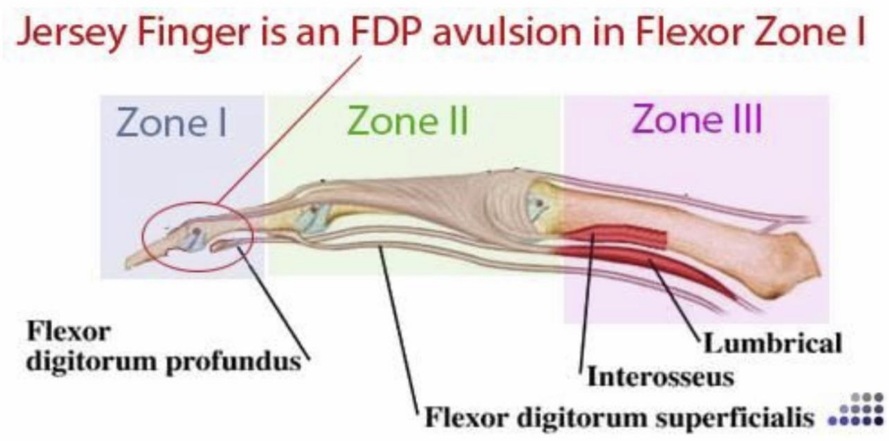
Note that while the profundus distinctly flexes the distal interphalangeal (DIP) joint, it also indirectly flexes the proximal interphalangeal (PIP) joint as well. (This has important implications for physical examination, as the mere ability to flex the proximal interphalangeal (PIP) joint does not prove that the superficialis is intact; rather, such motion may reflect the indirect action of the profundus.)

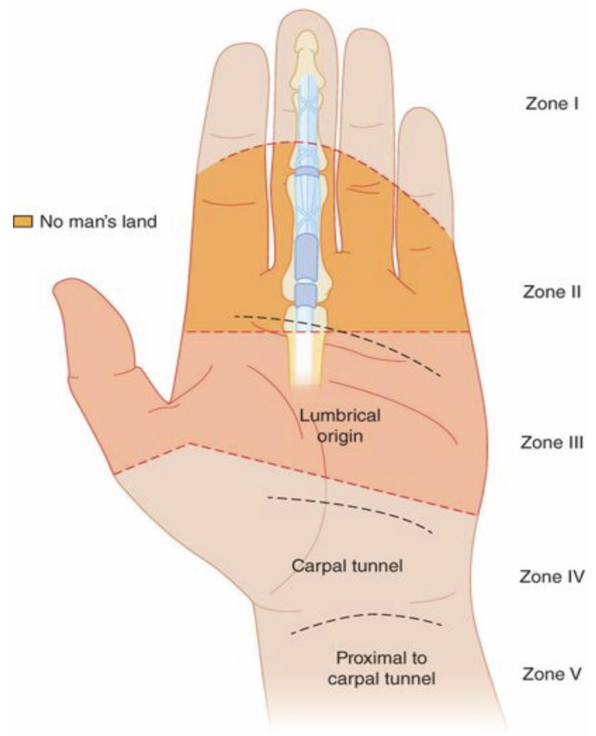
- **Mechanism of injury:**

Close injury	Open injury
Completely flexed and then sudden severe hyperextension of the fingers Examples: • Fracture at site of insertion • Jersey finger will cause avulsion of the tendon from its insertion that will manifest as loss of the normal finger cascade	1. Laceration: Knife is the most common tool for the injury 2. Crush injury: heavy object fall on it (in american football players) 3. Degloving injury: Open hand injury most of the time leads to flexor tendon injury

- **Verdan's 5 zones:**
  Classified mainly to get an idea of the expected outcome after repair.

ZONE 1	Distal to the PIP Only affects the FDP.	
ZONE 2	Comes out from the distal palm or metacarpal head all the way to the PIP and contains both FDP and FDS. The worst zone to fix because it's a small area, It has been called "No Man's Land" because repair in this zone is very difficult. Why is it the worst? Because it has 2 nerves, 2 arteries and 2 tendons.	
ZONE 3	(palm) From distal area of carpal tunnel to metacarpal head and also contains both FDP and FDS. (Dangerous because it also affects nerves and arteries)	Zones 3,4 and 5 have a good chance of full recovery; as you go distally
ZONE 4	Is the carpal tunnel and contains everything "median nerve and the 9 tendons".	
ZONE 5	The distal forearm proximal to carpal tunnel.	



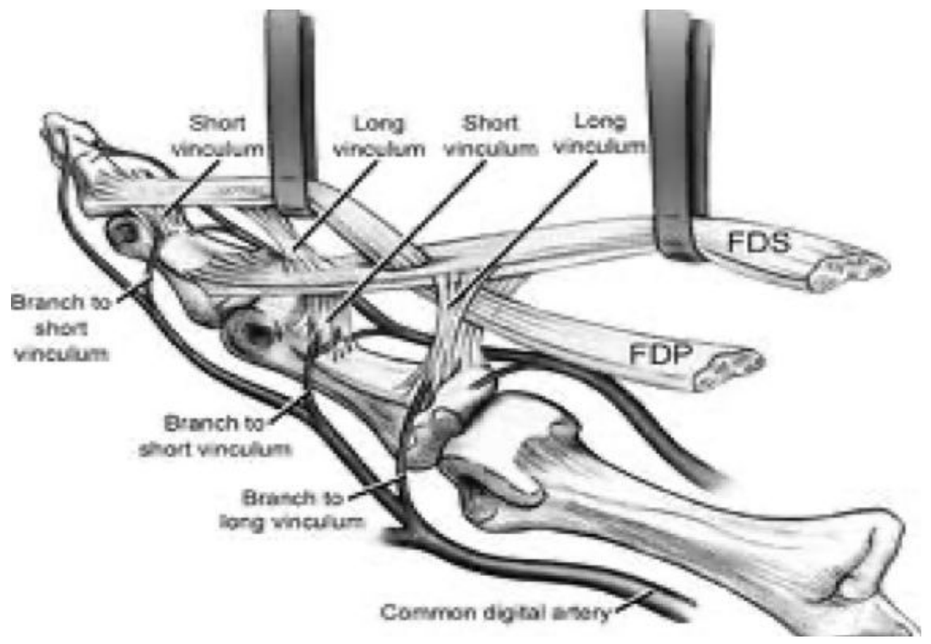


Every finger has 2 tendons (superficialis and the profundus) superficialis above the profundus and it splits into 2 and the FDP goes below this split to insert into the distal phalanx.

Pulley system and tendon blood supply:

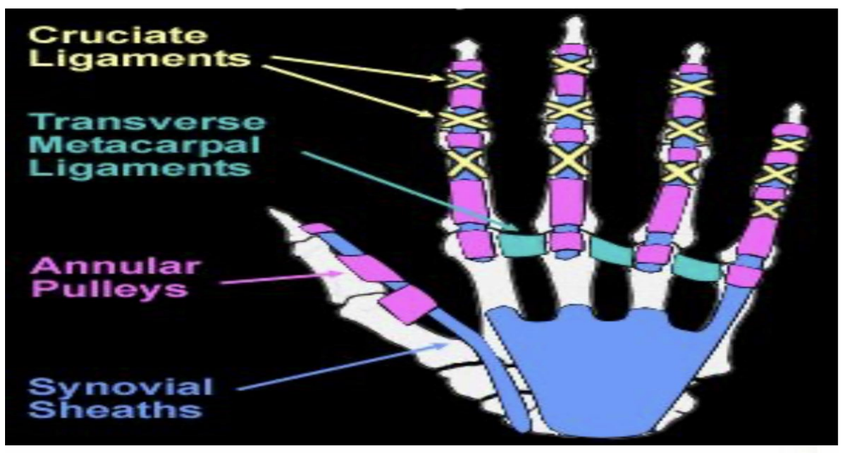
Each tendon has its own blood supply

Fibers that hold the tendon in place, This is more advanced for the plastic residents but you just need to know that these are ligaments to hold the tendon in place, we have 8 of them.



Annular pulleys ligaments: 5 (A1-A5)

- A2 and A4 are critical to prevent bowstringing.
- Most biomechanically important.
- A1, A3 and A5 ovelie the MP, PIP and DIP joint respectively.
- Originate from palmar plate.
- A1 pulley most commonly involved in trigger fingers.

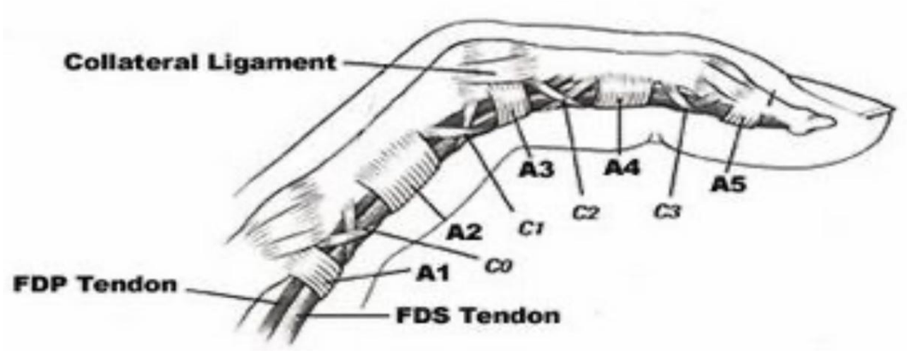


Annular Pulleys: A1, A2, A3, A4, A5
Cruciform Pulleys: C0, C1, C2, C3

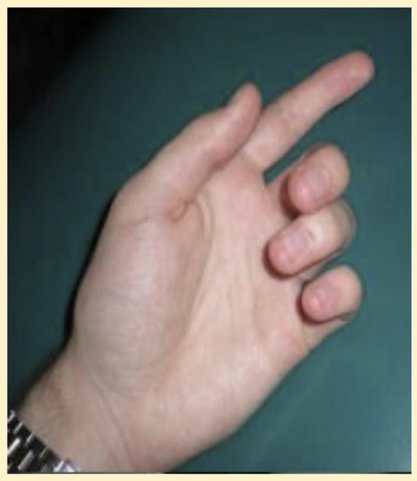
Cruciate pulleys: 4 (C0-C3)

- Function to prevent sheath collapse and expansion during distal motion.

3 total at the level of the joints.



Clinical examination and finding:



What happens when you cut your finger?

- Loss of flexion cascade. Is diagnostic that this patient lost their flexor tendon.
- Open wound most commonly.
- Tendon could be visible in the wound.
- Inability to flex the digit at PIP and DIP.

How to examine FDS and FDP? You have to know them.

Flexor digitorum superficialis "FDS"	Flexor digitorum profundus "FDP"
• The Flexor Digitorum Superficialis (FDS) inserts into the middle phalanx of each finger. • It is tested by blocking 3 fingers and asking the patient to flex PIP of the 4th finger. • To block the MCP joint, hold the proximal phalanx in extension just distal to the MCP joint, so that the **MCP joint is unable to bend when the patient tries to flex the finger**	• The Flexor Digitorum Profundus (FDP) inserts into the distal phalanx of each finger. • It is tested by blocking the finger PIP joint and asking the patient to flex the DIP joint. • To block the PIP joint, hold the middle phalanx in extension just distal to the PIP joint, so that the **PIP joint is unable to bend when the patient tries to flex the finger.**

Flexor tendon repair:

It doesn't need to be fixed ASAP, someone cuts his tendon today it doesn't need to be fixed tonight you could do it within 7 days.

- Explore the wound in **zigzag** fashion because the scar will cause contracture. in OR because this area has nerves and blood vessels.
- Find the 2 ends of the cut tendon and fix them with needles so that they won't come back again because these tendons are very strong!
- Insert needle Repair: > 25 different technique for the repair.
- Non absorbable suture because of the poor blood supply.

This is very common in Eid AlHajj, everyone is cutting meats and they cut their fingers :)

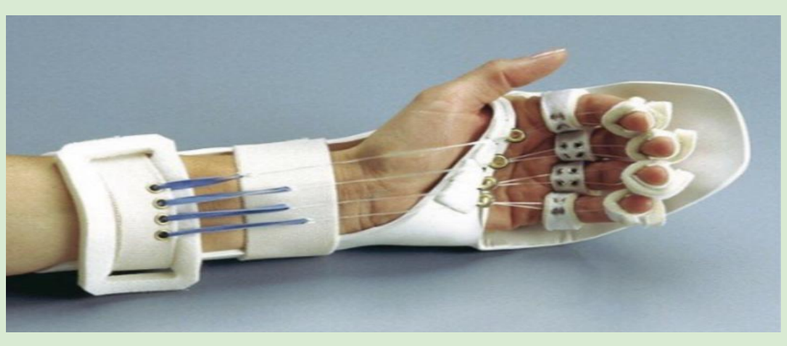




Flexor tendon SPLINTS:

You can't let the patient use his hand the suture will rupture! So we put them on a protective splint.

Active splint, to avoid adhesion of the tendon after the repair we use this splint. The patient can actively move their fingers backward to avoid adhesion of the tendons and it contains threads to protect the repair "limits the movement".



Static splint, you keep the hand in this position for 4 weeks and then you start physiotherapy. But the problem with this splint when you repair the tendon there are too much stitches, and if the tendon doesn't move it will slips.

Replantation

the restoration of any part of the body to its original site

- **Indications and contraindications:**

Indications	Contraindications
• Amputated Thumb. It provides 60% of the hand function, it's very important that kids who are born without thumb we take their index and put it as a thumb. • Children. The risk of loss is higher than adults because vessels are very small & more difficult. • Multiple digits. Someone had his all 5 fingers cut, you cannot say he's a smoker I cannot put his fingers back on. No! His hand cannot function so you have to try to put them back on. • Partial or whole hand	• Life threatening injury. You want to save the patient's life it's more important. Someone fall down from a building, cut 2 fingers and ruptured his aorta you won't waste time on the fingers. • Severe chronic illness ex: poorly controlled DM, hypertensive, EF<10% • Multilevel injury some mafia's when they want to punish someone they cut their fingers at multiple level so they know no one can put them back on (they cut the tendon and nerves 3 times) • Severely crushed injury اصبع اندعس عليه بالسياره مثلا (X-ray the amputated part to detect crush injuries) • Single digits. Because the patient will not have functional defects. They do it sometimes because they only want the residents to train • Severe contaminations واحد انقطع اصبعه وطاح وانتم بكرامة بالحمام، ما برجع احطه مره ثانية • Avulsion injury: Finger skin and tissue gets pulled out leavening only the bone

- **Replantation general principles:**

It's very important that the piece you bring is healthy, it has to be clean and stored properly (in a moist gauze in plastic bag and then in a bag full of crashed ice). Don't put it on ice directly (frostbite finger). How to restore is very important.

- Resuscitates the patient.
- Keep amputated part in moist gauze.
- X-ray the hand and the amputated part. If the finger had 4 fractures then it's better not to fix it.
- Consent for vein, nerve, tendon and skin graft.
- Prepare the amputated part.
- Shorten the bone.
- Arthrodesis.
- Repair flexor and extensor tendon.
- Repair digital artery, vein and nerve.
- Skin closure +/- skin graft.
- You repair the amputated part, fix the bone.

You repair the amputated part, shorten the bone, fix the bone, fix the tendon, do the artery, do the nerve and then do the veins and then you can close the skin and you might need skin grafts. So it's a long process.

- **Replantation complications:**

White finger No blood flow (low arterial flow)	Blue finger No venous drainage (high venous flow)
If the patient is a smoker don't bother to replant. **1-Ensure patient is warm** **2-Full with fluid (well-hydrated)** **3-Prevent hypotension** **4-Loosen dressing.** **5-Remove sutures.** **6-Re-explore.**	**1-Elevate limb.** **2-Loosen dressing.** **3-Remove sutures.** **4-Leeches** (Leeches, in case of **venous congestion,** suck the blood 6 relieving the congestion) **5-Remove nail.** **6-Heparin injections.** **7-Re-explore.** 

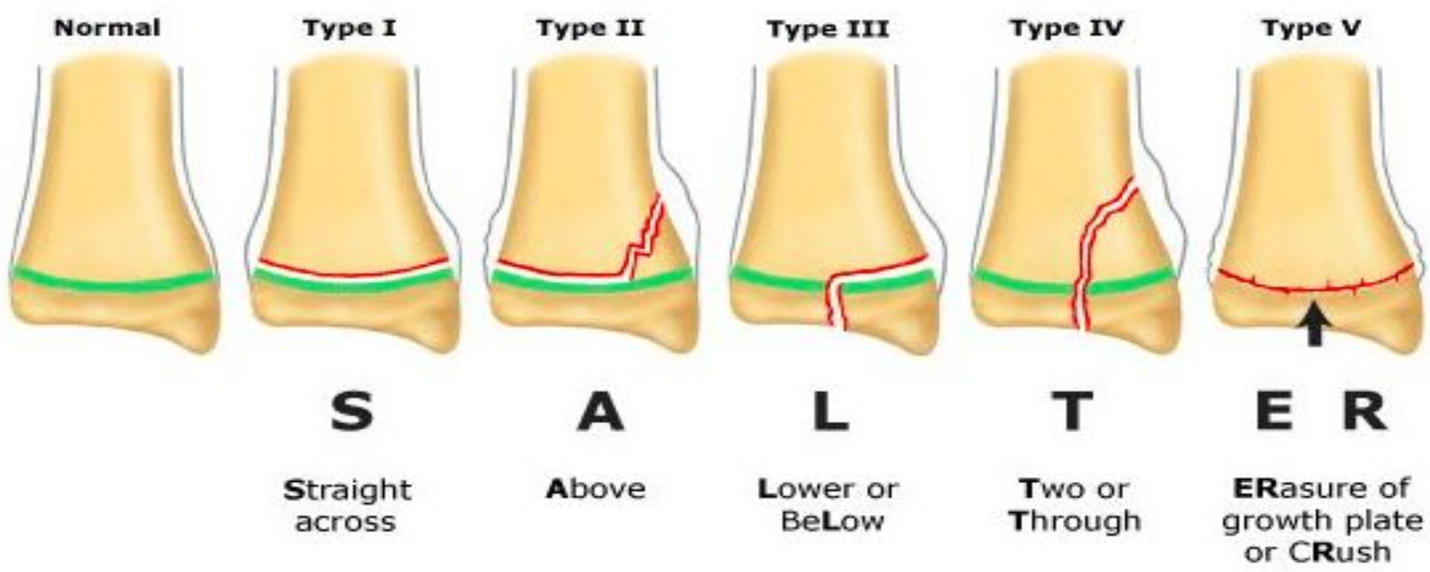
Hand fractures

Hand fractures is the most common thing you see here in plastics.
The commonest is metacarpal head fractures, the metacarpal are very mobile.

Unstable fracture	Acceptable hand fractures	Unacceptable phalangeal fractures (needs fixation)
• Cannot be reduced closed or cannot be held reduced without fixation. • **Antibiotics:** ○ 30% risk of infection in open fracture including open distal phalanx fracture. ○ Reduce to 3% with antibiotics • **The distal phalanx fracture with subungual hematoma** (bleeding in nail) **should be considered open.** • Healing 4 weeks/52's for phalangeal fracture. 5-6/weeks 52's for metacarpal fracture.	• Certain locations of fractures that is acceptable to keep. • **Tuft distal phalanx.** (periphery bones) • AP displaced metaphyseal fracture in children. • Metacarpal neck fracture ○ <15 in index and middle finger ○ <30-40 in ring and little finger. ○ **Boxer's fracture**: a fracture of the neck of the 5th or less common the 4th metacarpal, usually the cause is a strong hit from a closed fist on a immobile object, in frustrated situations. Very common • **Metacarpal base fracture** ○ Adult < 20 ○ Children < 40 • Index finger and middle finger, these are what we call the fix part of the hand.	• Rotational angulation (always needs surgery) • Severe dorsal angulation. • Lateral angulation.

❖ SALTER HARRIS FRACTURES (in pediatrics):

TYPE I (6%)	A transverse fracture through the growth plate
TYPE II (75% MOST COMMON)	A fracture through the growth plate and the metaphysis, sparing the epiphysis
TYPE III (8%)	A fracture through growth plate and epiphysis, sparing the metaphysis
TYPE IV (10%)	A fracture through all three elements of the bone, the growth plate, metaphysis, and epiphysis .
TYPE V (1%) (THE WORST)	A compression fracture of the growth plate (resulting in a decrease in the perceived space between the epiphysis and diaphysis on x-ray). NARROWING OF GROWTH PLATE AS A RESULT OF Fracture in child (growth plate) will affect growth, if the fracture in one side after 6 years pt will come with angulation of finger b/c one side grow and other didn't. If one grows more than the other, what happen? fingers will rotate



❖Indication for fixation non articular:

- **Rotational** if your hand your fingers rotate to each other.
- **Shortening** the fingers look short.
- **angulation** one Piece up and the other down, they always relay to dorsal end.

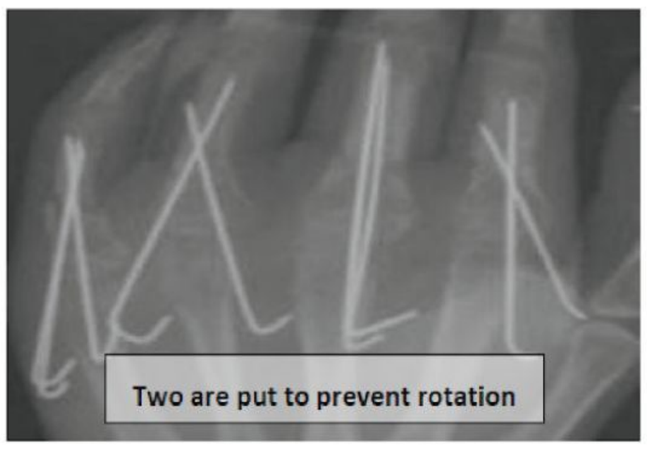
❖Technique of fixation:

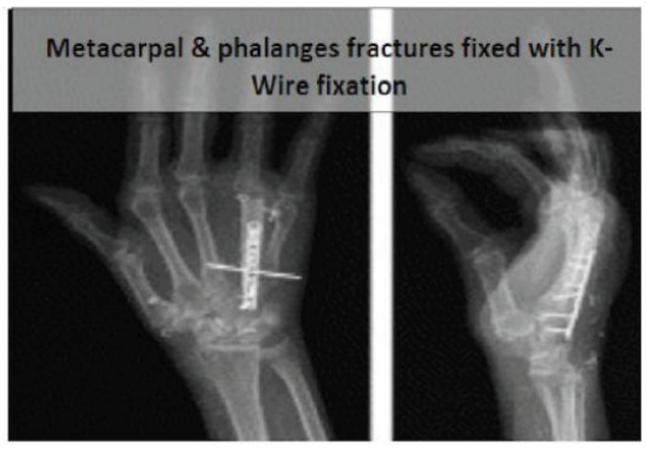
- Close reduction splint
- Close reduction K-Wire fixation
- ORIF (Open Reduction Internal Fixation)
  - Lag Screw
  - Plate
  - Cerclage wire

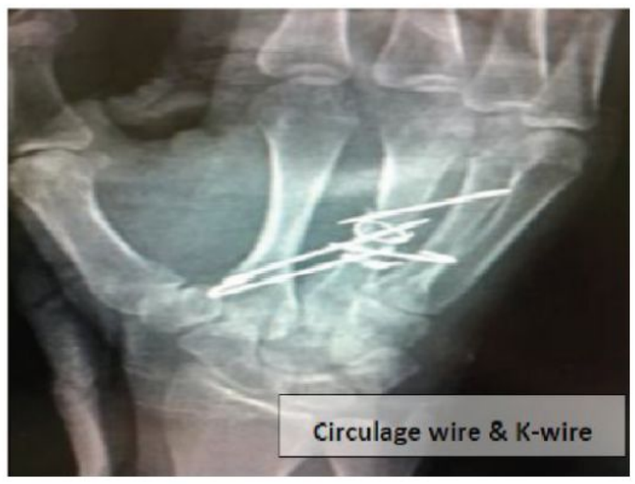
What is the most rigid fixation? Plate and screw

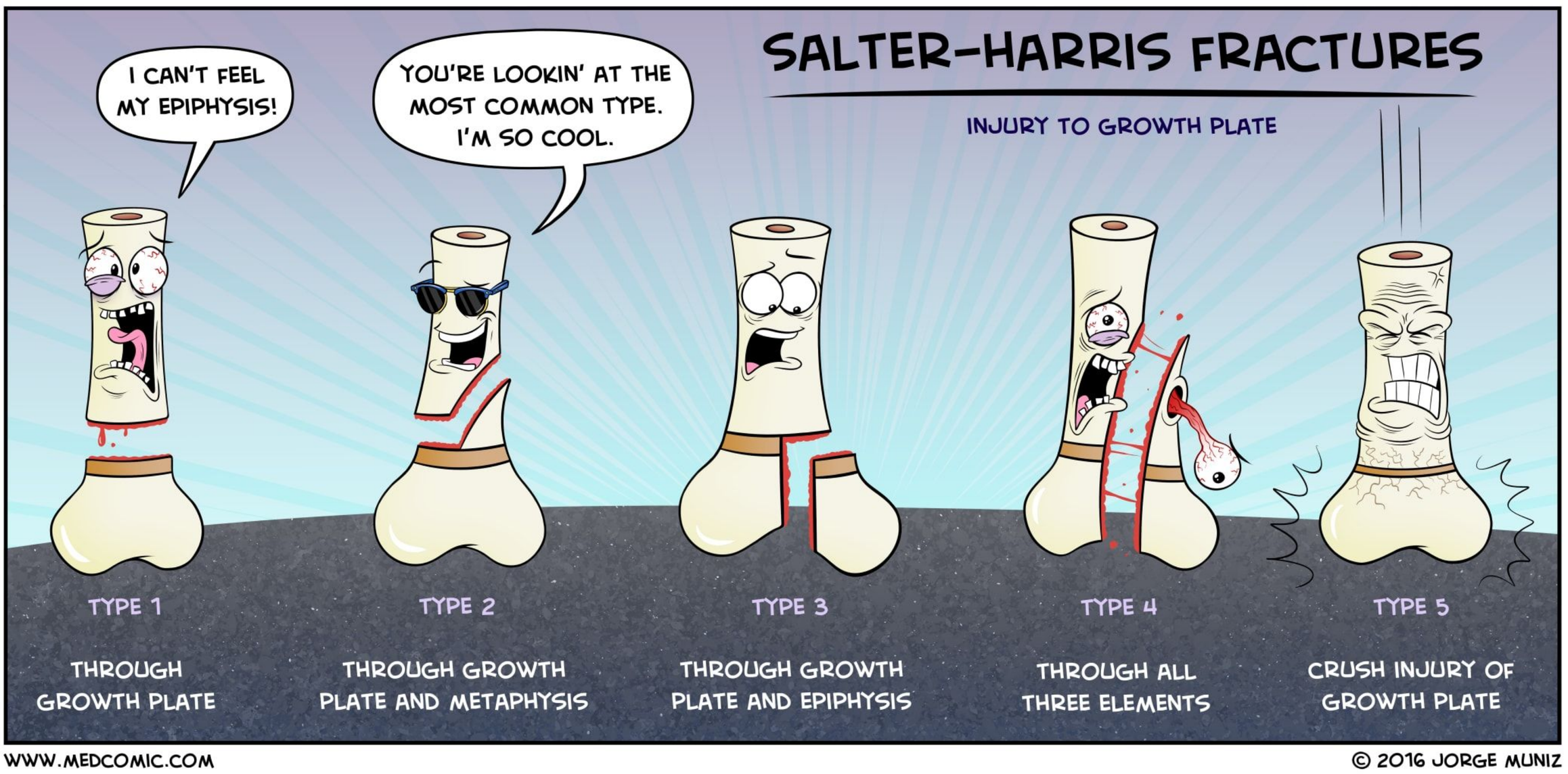
important point to understand is that growth plates are at the base of fingers but at the head of the metacarpals

- 1st do x-ray:
  - if you have fracture and it looks fine in position ⇒ splint him and send home and repeat the x ray after one week if it's okay then continue the splint for 11 weeks , if not then you do close reduction.
  - if you have fracture that displaced with deformity ⇒ you try to close reductions , then **repeat X Ray:**
    - if it look in position ⇒ send home and repeat the x ray again in one week if it moved again take him to surgery
    - If it displaced ⇒ you need to fix this fracture how? By K-wire fixation, screw or plate





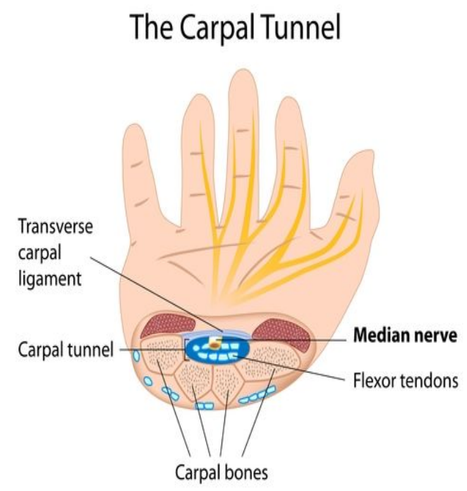




Carpal tunnel syndrome

Incidence & Aetiology

- The most common nerve compression in the upper limb: 1- 10% of the population.
- The most common chronic hand problems, approximately 10% after age of 60 will have carpal tunnel syndrome.
- As high as 60% in people with repetitive hand movement, Because of hand swelling
- more common in patients with DM, hypothyroidism, hyperthyroidism, osteoarthritis, lipoma, trauma, Ganglion,Inflammation Tenosynovitis, gout , TB , renal failure, acromegaly and pregnancy (it's very common to come with numbness during pregnancy then relieved after delivery) , also it can be acute conditions such in wrist fracture so you should fix the problem immediately.
- **Anatomy** :
  - Base (floor) is the bony carpal arch.
  - Bridge (roof) is the flexor retinaculum..
  - Has 9 flexor tendon and the median nerve.
- **Aetiology:**
  - Due to increase volume of the content or reduction of the tunnel size.
  - Acromegaly
  - Trauma
  - OA
  - Ganglion, Lipoma
  - Inflammation Tenosynovitis, gout
  - DM, Thyrotoxicosis, Pregnancy
  - Congenital :Abnormal muscle, Persistant median artery



- PATHOPHYSIOLOGY: EITHER SWELLING OF THE FLEXOR RETINACULUM CONTENT OR REDUCED TUNNEL SIZE > COMPRESSED FLEXOR RETINACULUM > COMPRESS THE MEDIAN NERVE.

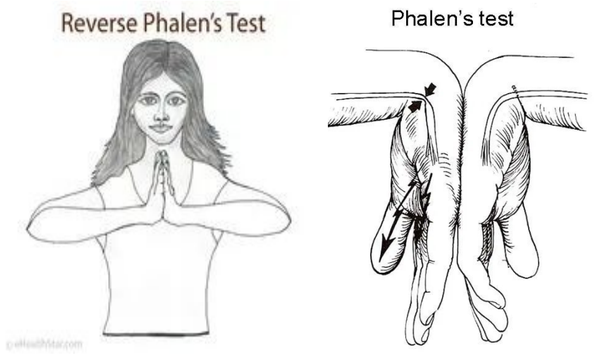
Symptoms

symptoms of median nerve compression.

- **Pain.**
- **Numbness** (in the morning >edema happens during sleeping). Diagnostic feature
- **Weakness** of the thenar muscles if it lasts long.
- **Night pain** (cause some people my compress it more during sleeping).
- **Paraesthesia** in the median nerve distribution , Radial 3.5 digits.
- **Pain radiates proximally to the shoulder.**
- **Clumsiness** (if he hold anything, it falls).

Clinical features

- Weakness & wasting of hand thenar muscles . When they hold something, it falls.
- Altered sensation in the median nerve distribution:
- Positive Tinel's sign : lightly tapping over the pathway of the median nerve to elicit a shooting numbness sensation in the distribution of the nerve.
- Positive Phalen test : This position should be held for 1 min => numbness or tingling along the median nerve distribution ,
  the duration gives you a clue how severe is the compression.
  A normal person will have it after 10 minutes
  يعني لو سوا الحركة وجاه تنمل بعد مثلا خمس ثواني ذا
  يدل ان يده تعبانه أكثر من الشخص اللي جاه تنمل بعد دقيقه مثلا
- Reverse Phalen test (has to be straight) The more severe the compression the faster the numbness.



Investigations

- Nerve conduction studies diagnostic test: **Most common test use for documentation, confirmation test.**
- X-Ray
- CT scan
- MRI

Treatment

- **Non-Operative** (Mild) for pregnant ladies or patients who doesn't want a surgery.
  1. Splints : Rests the hands but once stopped > symptoms will return.
  2. NSAIDs
  3. Steroid Injections (Not preferred BECAUSE IT DAMAGES THE NERVE STRUCTURE AFTER RELIEF)
- **Operative:**

1. All Open technique (DIVIDE THE TRANSVERSE CARPAL LIGAMENTS)
2. Limited incision Technique
3. Endoscopic Techniques: The best approach, why? Tiny incision, less pain, less complaint, less scar, returning to work faster.

Carpal tunnel syndrome open release

Hand injuries

Hand infections

Infection type	Important points	Site	Treatment

Paronychial	• **Most common hand infections**
	• Organism:
	  ○ Acute? S. Aureus
	  ○ Chronic? Candida
		Around, below & on the sides of the nail.	• Early: Antibiotic and soaking.
			• Late: (IND).
			• **Recurrent inf.**: Remove the skin clean and then graft.

Felon	Very severe pain	Fingertip pulp	• **Early**: Antibiotic and soaking. • **Late** or **AB didn't work**: IND, (Hockey stick incision)
Herpetic Whitlow	• Very painful small vesicles that contain clear fluid. • Extremely itchy. • Dentist are more prone to get this infection. • Very contagious.	Fingertip	Analgesics, Acyclovir and isolation.
Coller Abscess	Painful web-space, redness, swelling and abducted fingers	Abscess of the hand web-space	• **Early**: Antibiotic and soaking finger Analgesia. • **Late**: IND, then reconstruction.
Flexor tenosynovitis	**4 signs:** 1. Sausage-shaped fingers. 2. Flexed position 3. Pain with passive extension 4. Tenderness along the tendon.	Flexor tendon and the synovial sheath.	• Antibiotic and analgesia with Admission & observation for 24hrs • No response? IND, Catheter irrigation with saline.

Hand Bies	• **Organisms**:
	  ○ **Human bite**: Staph, strep, eikenella
	  ○ **Dog bite**: Pasteurella Multocida (very dangerous), Staph, Strep All must get rabies treatment: IgG and rabies vaccine (5 injections in abdomen at day 1,3,7,14,28)
	  ○ **Cat bite**: Pasteurella Multocida
			IND & IV antibiotics

Necrotizing fasciitis	• Diabetics with low socioeconomic status • Very sick people (hemodynamically unstable) • Immunocompromised • Caused by GAS	Skin and soft tissue	**EMERGENCY** • Extensive debridement and IV Antibiotics

Hand injuries

Replantation

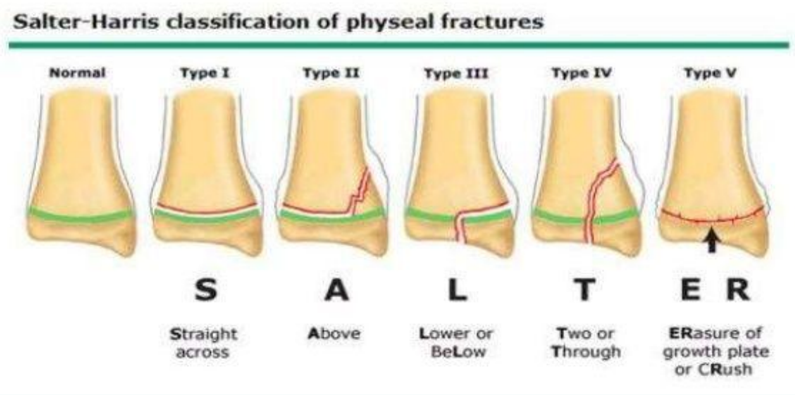
Indications	Contraindications
● Amputated Thumb. ● Children. ● Multiple digits. ● Partial or whole hand.	● Life threatening injury. ● Severe chronic illness. ● Multilevel injury. ● Severely crushed injury. ● Single digits. ● Severe contaminations. ● Avulsion injury.

Hand fractures

Unstable fracture	Acceptable hand fractures	Unacceptable phalangeal fractures (needs fixation)
● Cannot be reduced closed or cannot be held without fixation. ● Antibiotics ● The distal phalanx fracture with subungual hematoma should be considered open. ● Healing 4 weeks/52's for phalangeal fracture. 5-6/weeks 52's for metacarpal fracture.	● Tuft distal phalanx. ● AP displaced metaphyseal fracture in children. ● Metacarpal neck fracture ○ <15 in index and middle finger. ○ <30-40 in ring and little finger. ● Metacarpal base fracture ○ Adult < 20 ○ Children < 40	● Rotational angulation. ● Severe dorsal angulation. ● Lateral angulation.

Salter-Harris Classification

- Only used **for pediatric fractures** that involve the growth plate (physis)



Indication for fixation non articular:

- Rotational, Shortening & angulation

Carpal Tunnel Syndrome

Incidence	● The most common nerve compression in the upper limb. ● More common in patients with DM, acromegaly and pregnancy. ● Anatomy : ○ Base (floor) is the bony carpal arch. ○ Bridge (roof) is the flexor retinaculum. ○ Borders: 2 radial carpal bones and 2 ulnar carpal bones. ○ Has 9 flexor tendon and the median nerve. ● **PATHOPHYSIOLOGY:** EITHER SWELLING OF THE FLEXOR RETINACULUM CONTENT OR REDUCED TUNNEL SIZE > COMPRESSED FLEXOR RETINACULUM > COMPRESS THE MEDIAN NERVE.
Symptoms	● **Pain, Numbness, Weakness, Night pain.** ● **Paraesthesia, Pain radiates proximally to the shoulder & Clumsiness.**
Clinical features	Weakness & wasting, Altered sensation in the median nerve distribution. Positive Tinel's sign, Phalen & Reverse Phalen tests.
Investigations	**Nerve conduction studies (diagnostic),** X-Ray, CT scan & MRI.
Treatment	● **Non-Operative (Mild)**: Splints, NSAIDs & Steroid Injections ● **Operative: (3** techniques) All Open - Limited incision - Endoscopic the best approach

Quiz

1. Which of the following is the most common type of hand infections ?

A. Paronychial infection
B. Felon
C. Herpetic whitlow
D. Necrotizing fasciitis

2. Which of the following is the treatment of chronic paronychial infection (recurrent infection) ?

A. Antibiotic + soaking
B. Antibiotic only
C. Incision & drainage
D. Remove the skin clean then graft

3. Which of the following is not an indication for replantation ?

A. Amputated thumb
B. Multiple digits
C. Avulsion injury
D. Children

4. "Fracture of Growth plate & Epiphysis" describes which type of SALTER HARRIS FRACTURES (in pediatrics) ?

A. TYPE I
B. TYPE II
C. TYPE III
D. TYPE IIII

5. Which of the following is the diagnostic investigation for carpal tunnel syndrome ?

A. CT scan
B. Nerve conduction studies
C. MRI
D. X-Ray

6. 48-year-old auto mechanic presents to the clinic with complaints of many years of"pins and needles" in his left hand that initially occurred on while working but have worsened substantially. He claims the pain wakes him almost every night. Physical examination reveals marked weakness and wasting of the left hand muscles. Which of the following is the most likely diagnosis?

A. Amyotrophic Lateral Sclerosis

B. Angina

C. Carpal tunnel syndrome

D. Multiple sclerosis

7. A visibly upset 15-year-old boy is brought to the emergency department because he punched a wall and now has pain in his hand. The physician tells the patient that he has broken his hand. Which of the following is the most likely site of this patient's fracture?

A.Distal radius

B. Hamate

C. Metacarpals

D. Phalanges

8. 7-year-old boy is brought to the emergency department after falling off his grandparents' deck; an X-ray film shows that he has a midshaft fracture of the hammers. Which of the following defects is most likely to occur with this type of fracture?

A. Protruding Scapula

B. Inability To Hold A Piece Of Paper Between Fingers

C. Pain over the palmar aspects of the first three and a half digits

D. Weakness in wrist extension

9. A 32-year-old man is brought into the emergency department by ambulance after falling from a ladder while cleaning his roof gutters. His vital signs are stable, he is fully alert and oriented, and he reports having no past medical problems. He is in excruciating pain, which he states is located in his left arm. An X-ray of the left upper extremity is shown the image. If left untreated, which of the following muscles is at risk of losing function due to this injury?

A. First And Second Lumbricals

B. Brachioradialis

C. Flexor Carpi Ulnaris

D. Opponens Pollicis

Answers

1.A 2.D 3.C 4.C 5.B 6.C

7.C This patient most likely has a “boxer's fracture,” which occurs when individuals strike a blow with a closed fist against a hard, unyielding object. The most commonly injured sites for experienced boxers are the first and second metacarpals.

8.D radial nerve and the deep brachial artery present at radial groove.. The radial nerve is known as the great extensor nerve. Radial nerve injury results in “wrist drop,” an inability to extend the wrist and metacarpophalangeal joints of all digits.

9.C This patient has fractured his distal humerus, which is a common way to injure the ulnar nerve.