HAND INFECTIONS

Prof. Dr. Mohammed Sh. Al-Edanni
Consultant Orthopedic Surgeon
Al-Kindy College of Medicine

- ⁎ **Incidence:** More in manual workers & house wives.
- ⁎ **Aetiology:**
- 1. **Predisposing factors:** Trauma, wounds or punctures
- 2. **Route of infection:** usually direct spread of infection or less commonly spread from the surrounding.
- 3. **Organism:** Usually staph. aureus (90%).
- ⁎ **Pathology:**
- • The condition starts by cellulitis which is followed by resolution or suppuration.
- • Sloughing and necrosis may result from bacterial toxins or pressure necrosis from tense oedema in closed space with increase pressure .

Hand Infections

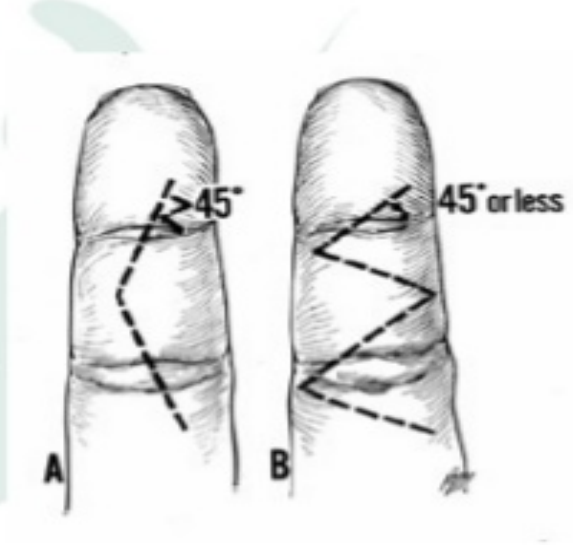
Introduction

- Treatment principles
  - early & adequate decompression of pus to avoid soft tissue loss
  - proper placement of incisions
    - avoids damage to adjacent structures
    - minimizes scar contracture
  - appropriate debridement of necrotic tissue
  - judicious splinting & early mobilization to minimize joint stiffness
  - appropriate use of Abx as adjunct to prevent dissemination of established infection

Hand Infections

Introduction

- For infections requiring drainage, pre-operative planning is required. Type & placement of incision should:
  - Allow direct access to the abscess cavity
  - Permit easy extension in any direction
  - Follow accepted principles of hand surgery



Hand Infections

High Risk Patient

- Up to 50% of hand infections involve:
  - Diabetic / Immune compromised
  - IDU
  - Bites

- Higher risk for developing severe complications:
  - Joint stiffness - Osteomyelitis
  - Contracture - Necrotizing Fasciitis
  - Amputation - Death

Classification:

- **1. Cutaneous & S.C infections:**
- • Paronychia
- • Pulp space infection
- • Web space infection
- **2- Fascial spaces infections:**
- • Thenar space
- • Hypothenar space
- • Midpalmar space
- • Parona space.
- **3- Synovial sheath:**
- • Digital tenosynovitis
- • Ulnar and radial bursitis

Clinical picture

- :
- **A) Before suppuration:** (as acute abscess).
- **B) After suppuration:** (as acute abscess):
- 1- **History** of the cause e.g. puncture wound .
- 2- **Pain, tenderness & swelling** (pain increases by dependency or during sleep). The site of **maximum** pain & tenderness is usually **diagnostic**.
- 2. There is diffuse **oedema**, maximum on the dorsum of hand (loose dorsal skin).
- **3. The characteristic features for the commonest hand infection**

Investigations:

- 1. **Blood picture:** Show leucocytosis with shift to the left .
- 2. **Culture & sensetivity** for pus.
- 3. **Plain X ray , u/s and CT scan:** for F.B or affection of bones.
- 4. Urine & blood testing for **D.M**., if there is recurrent infections.

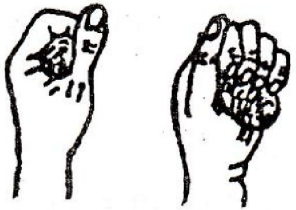
Treatment

- **: A) Before suppuration:**
- 1- General: **Antibiotics** against staph. aureus (flucloxacillin, amoxycillin, erythromycin & cephalosporins) & analgesics.
- 2. Local:
- a - **Elevation** of the hand (to diminish pain and oedema) by arm to neck sling or the hand is elevated above the level of the body.
- b - **Position** of hand: Put the hand in the position **of rest** (max flexion of little finger, least flexion of index with the thumb in opposition).
- C - Hot applications and **frequent examination** to detect suppuration early.

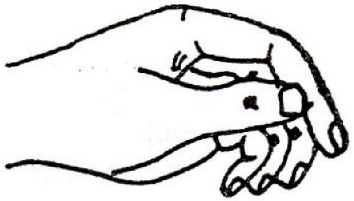
- B) **After suppuration:** Incision and drainage,
- **1. Anaesthesia:**
- • **Paronychia & pulp** space infection can be drained by **local ring anaesthesia** without adrenaline at the root of the finger (or median or ulnar **nerve block**).
- • **General** anaesthesia is preferred for **other hand infections**.

- **2-** This should be done **once pus is formed** (throbbing pain & hectic fever without waiting for fluctuation) or **no response** to one day intensive antibiotic therapy.
- **3-** The field should be **bloodless** : by elevating the limb for few minutes & Sphygmomanometer calf is inflated above systole.
- **4- Incision** is done at the site of selection over the **point of max. tenderness** & **away** from important structures (vessels ,nerves and tendons) and **never** cross a skin creases.

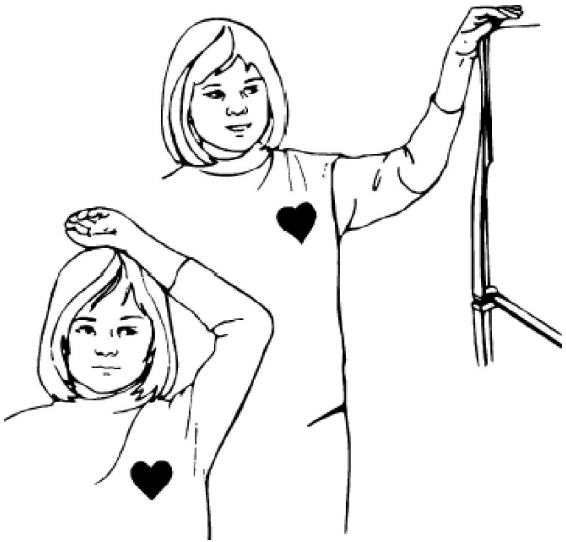
- **5-** All pus is **drained** by a **sinus forceps** leaving a clean cavity,
- **6-** Search for **collar and stud** abscess.
- **7- Soft drains** are preferred & dressing



• Position of function



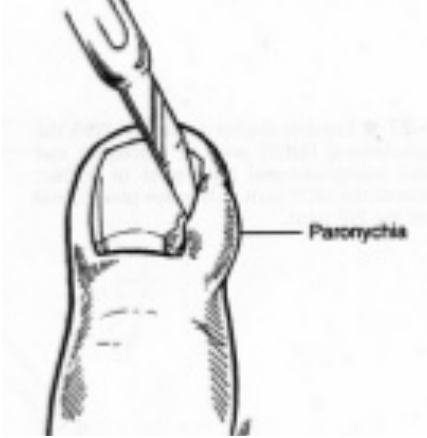
• Position of rest



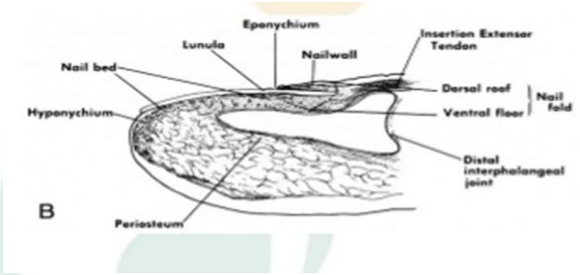
Acute Paronychia

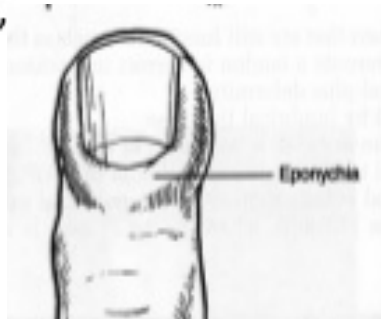
- ⁎ **Definition:** Acute Infection of the **nail fold**.
- ⁎ **Incidence:** The **commonest** hand infection.
- ⁎ **Aetiology**: Trimming skin tags or manicurist unsterile instruments.
- ⁎ **Clinical picture:** Pain, tenderness & swelling over the nail fold, max. at the angle.

Paronychia

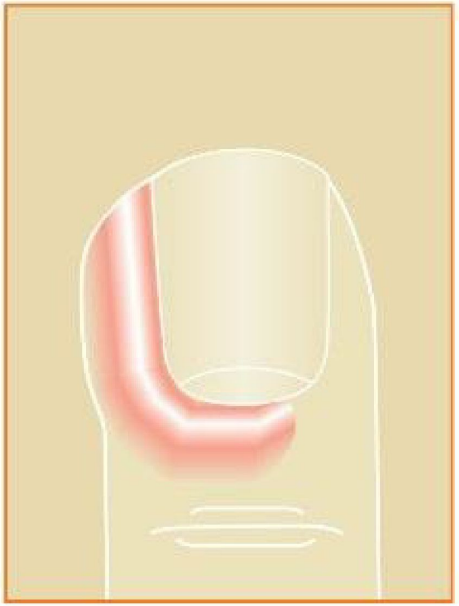


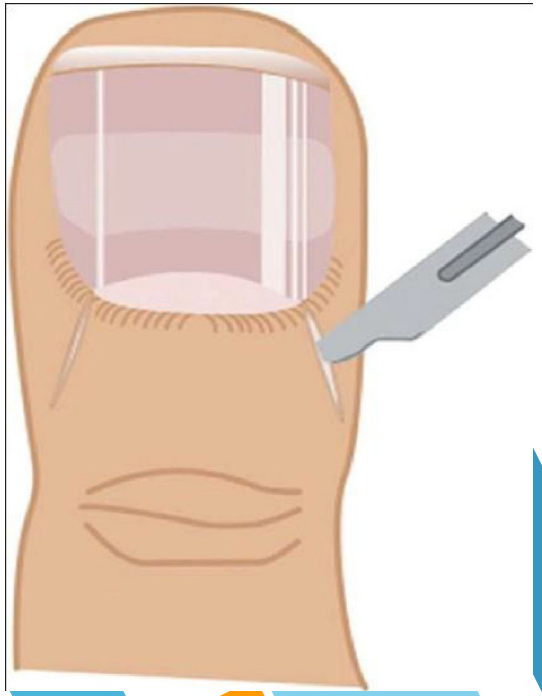
- infection in and around the nail fold
- Acute: any break in the seal between the nail and nail fold may serve as a portal of entry for infection
  - hangnails
  - manicures
  - nail biting
- usual causative agent: *S. Aureus*
- in more advanced infections, pus may accumulate beneath the nail plate, separating it from the underlying nail bed. This infection involves the entire eponychium and is called an "eponychia"
- Pus can also spread around the nail fold resulting in a "runaround infection"

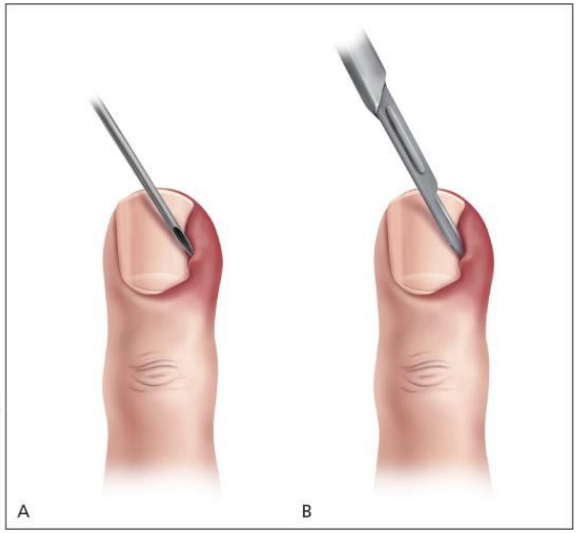


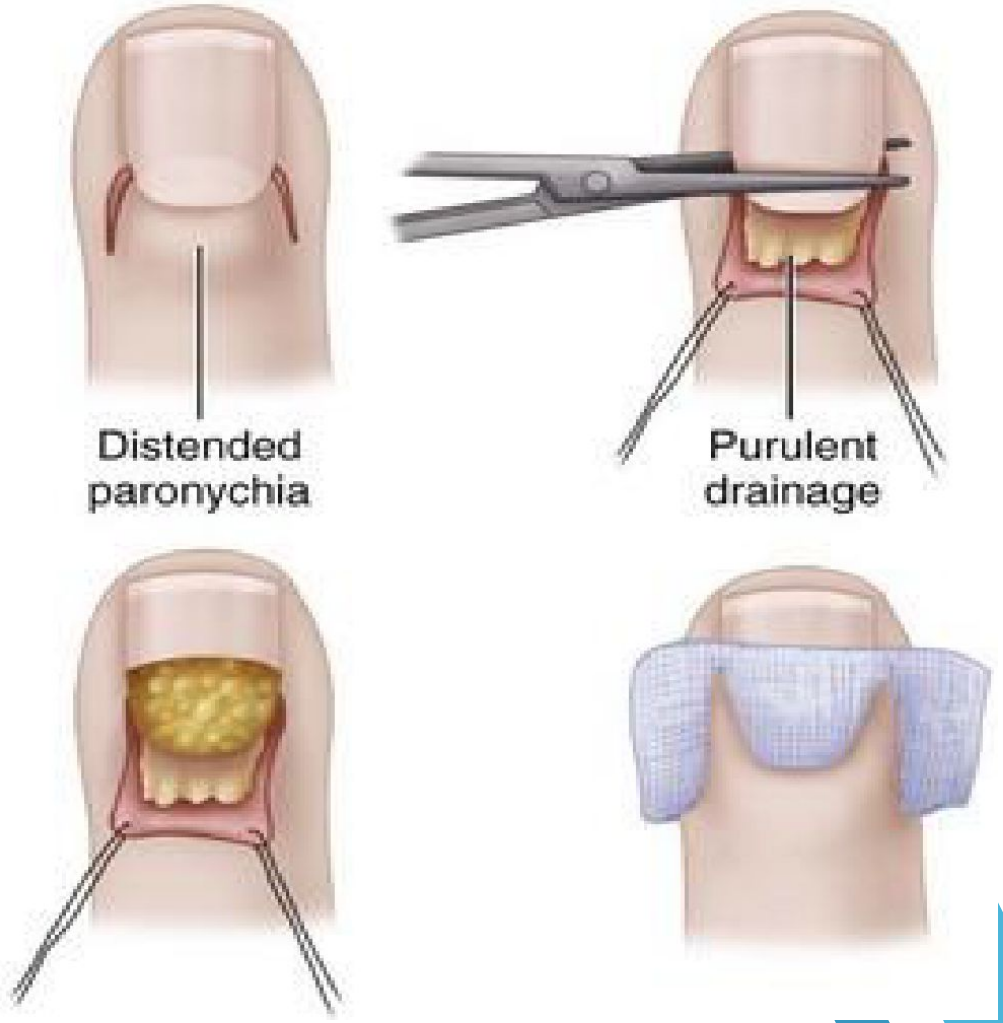


- **Treatment:** (as usual) +
- • when pus is formed (throbbing pain), **local ring anaesthesia** without adrenaline at the root of the finger and drainage by one of the followings :
- 1- A fine tipped **scalpel** to raise the nail fold & to incise the skin cap through which pus points
- 2- **Oblique incision** or excision of a triangle of skin at the angle of the nail fold.
- 3- If pus present **under the nail** → excise the related part of the nail.
- 4- If **floating nail** → the nail is dead and it is removed to drain infection.





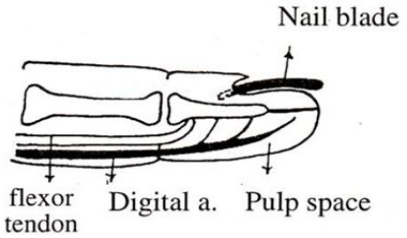

A
B
ILLUSTRATIONS BY DAVE KLEMM


Distended
paronychia
Purulent
drainage

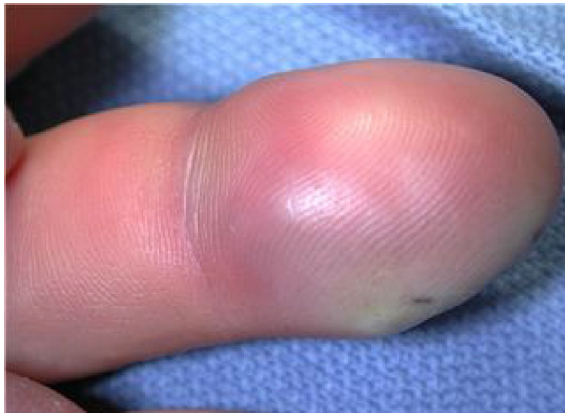
Chronic Paronychia

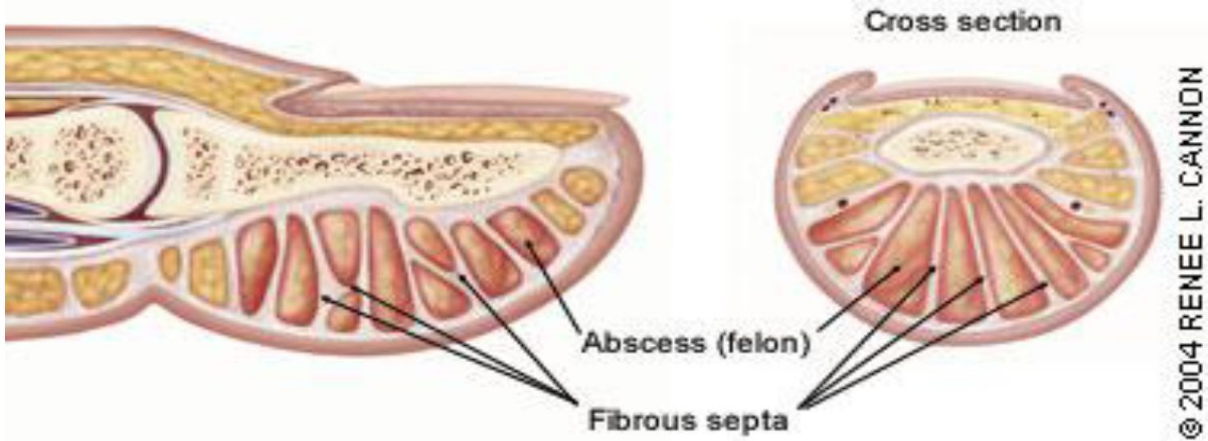
- Slightly different disease process with an indolent course marked by exacerbations & remissions
- Etiology: proximal nail fold obstruction + fungal infection
- Often seen in people whose hands are constantly in a moist environment
- Inflammation of the eponychial fold, often with separation from the underlying nail and intermittent drainage
- usual causative agent: *fungus > gram negative bacteria*
- Tx: eponychial marsupialization + topical antifungal
  - Crescent-shaped piece of skin excised proximal to nail fold
  - medical tx alone is largely unsuccessful

Felon infection



- **Anatomy :**
- **• It is the subcutaneous space in front of the terminal phalanx.**
- **• It is a closed space separated from the middle phalanx by the inter-phalangeal crease & shut on both sides & distally by a septum extend from skin to periosteum.**
- **It contains only fat & a digital a. (it gives branch to the proximal 1/2 of the distal phalanx before it enters the space).**
- **• It is divided into loculi by fibrous septa extending from the skin to the petiosteum.**



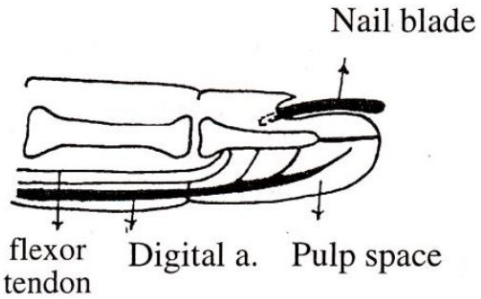


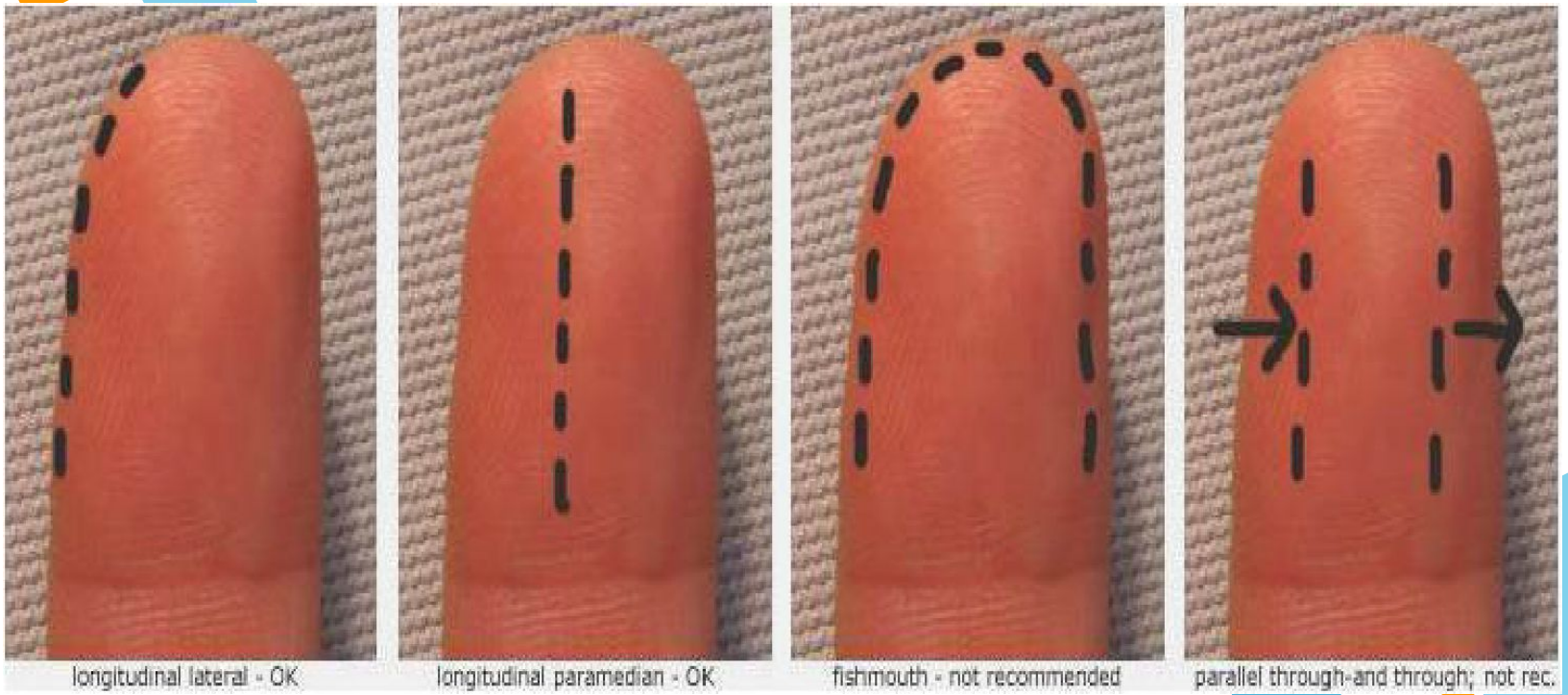
Felon infection

- ❋ **Incidence**: The 2nd common hand infection.
- ❋ **Aetiology**: (as before in general).
- ❋ **Pathology:**
- **A) Infection usually diffuse affecting all the pulp space (rarely remain localized in one compartment of the pulp).**
- **B) Pus collects rapidly and tension rises as it is a closed space.**

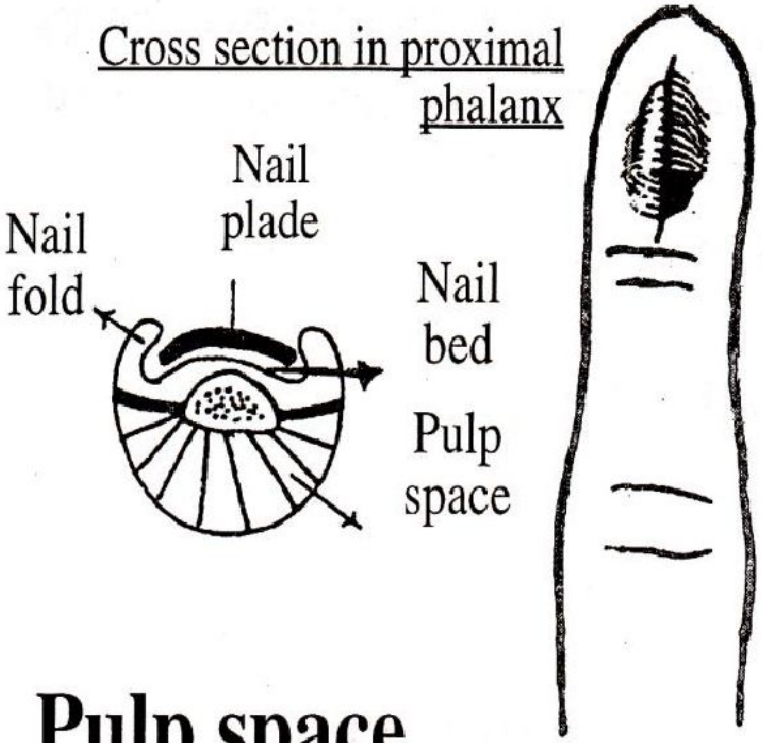
⁕ Complications:

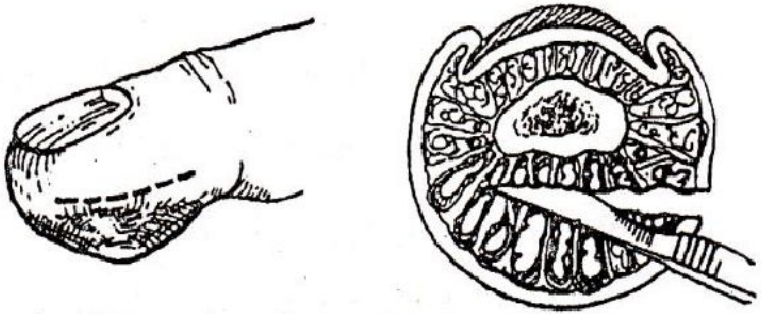
- **1) Ischaemia** of distal part of distal phalanx due compression and thrombosis of digital arteries. (The proximal part of distal phalanx is supplied by a branch arise from the digital artery before it enter the pulp space).
- **2) Parrot peak deformity** of the finger due to sequestration of the distal part of the distal phalanx.
- **3) Osteomyelitis** of the distal phalanx.
- **4) Teno-synovitis.**
- **5) Septic arthritis**.
- ⁕ **Clinical Picture:** Pain, tenderness & swelling over the pulp.



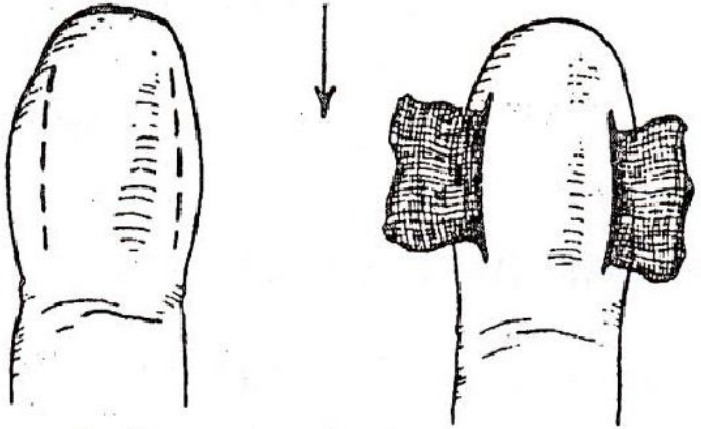

longitudinal lateral - OK
longitudinal paramedian - OK
fishmouth - not recommended
parallel through-and through; not rec.

Pulp space





1- Operation for pulp-space infection



2- Operation for late cases.

Web space Infection

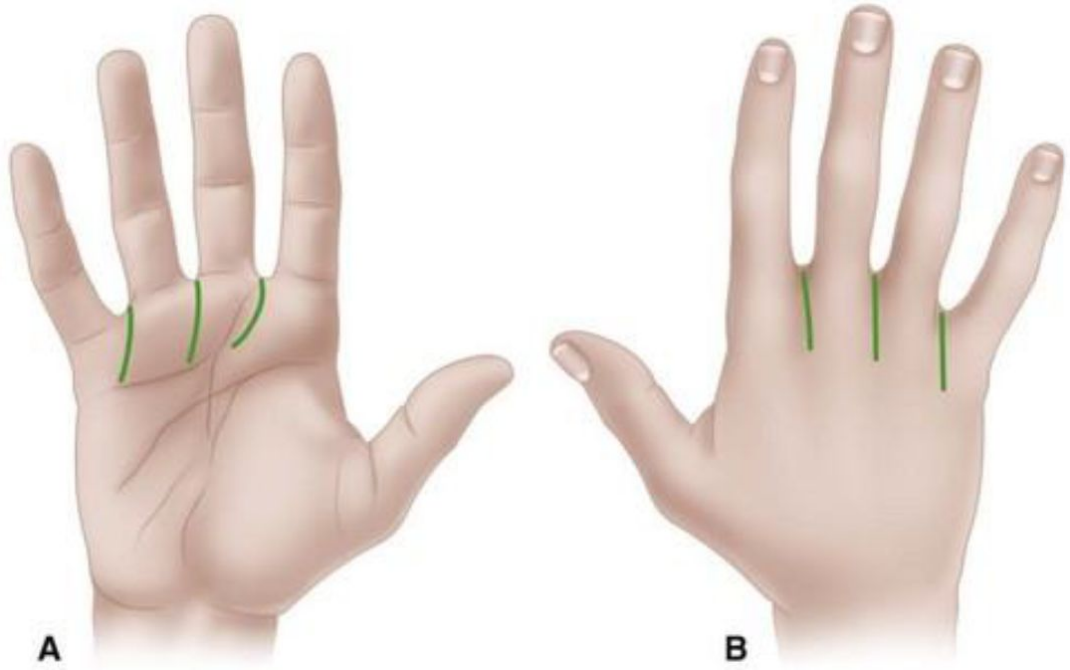
- ❋ **Anatomy :**
- • There are **3 web spaces**, each one of them is **wedge** in shape with **a base** at the free edge of the web and an **apex** between the 2 related metacarpo-phalangeal joints.
- • It is bounded **on both sides** by the proximal phalanx and both anteriorly and posteriorly by the skin of the web.
- • Each web space is **continuous** distally with related 2 proximal volar spaces (space in front of proximal phalanx).
- • Each space **contain** fat and a lumbrical muscle.
- • Along the lumbrical muscles infection may **spread** to the mid-palmar space or thenar space.

- **Aetiology:** (as general)
- ∗ **Complications: Spread** of infections along lumbricals to mid-palmar space & proximal volar spaces.
- ∗ **Clinical Picture:** Pain, tenderness & **swelling** over the web and opposing sides of the related 2 fingers with **separation** of the 2 adjacent fingers.


muhadharaty.com

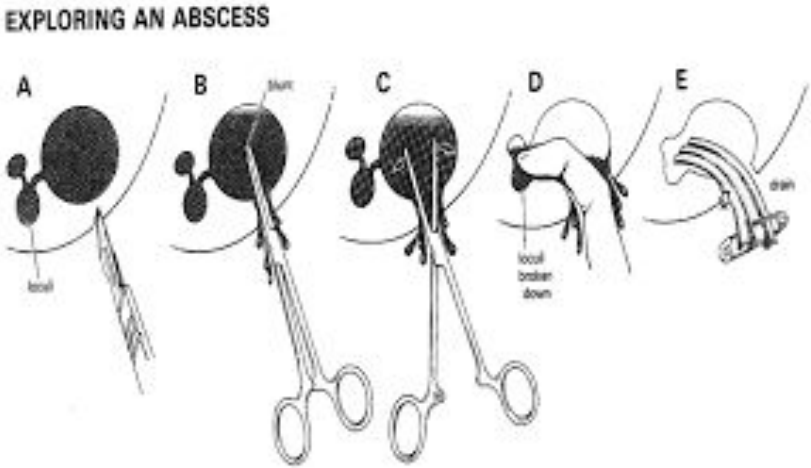
» **Treatment:** (as usual)

» • A **dorsal longitudinal** incision over the most tender point in the web then Hilton's method.



Hilton's method of I & D

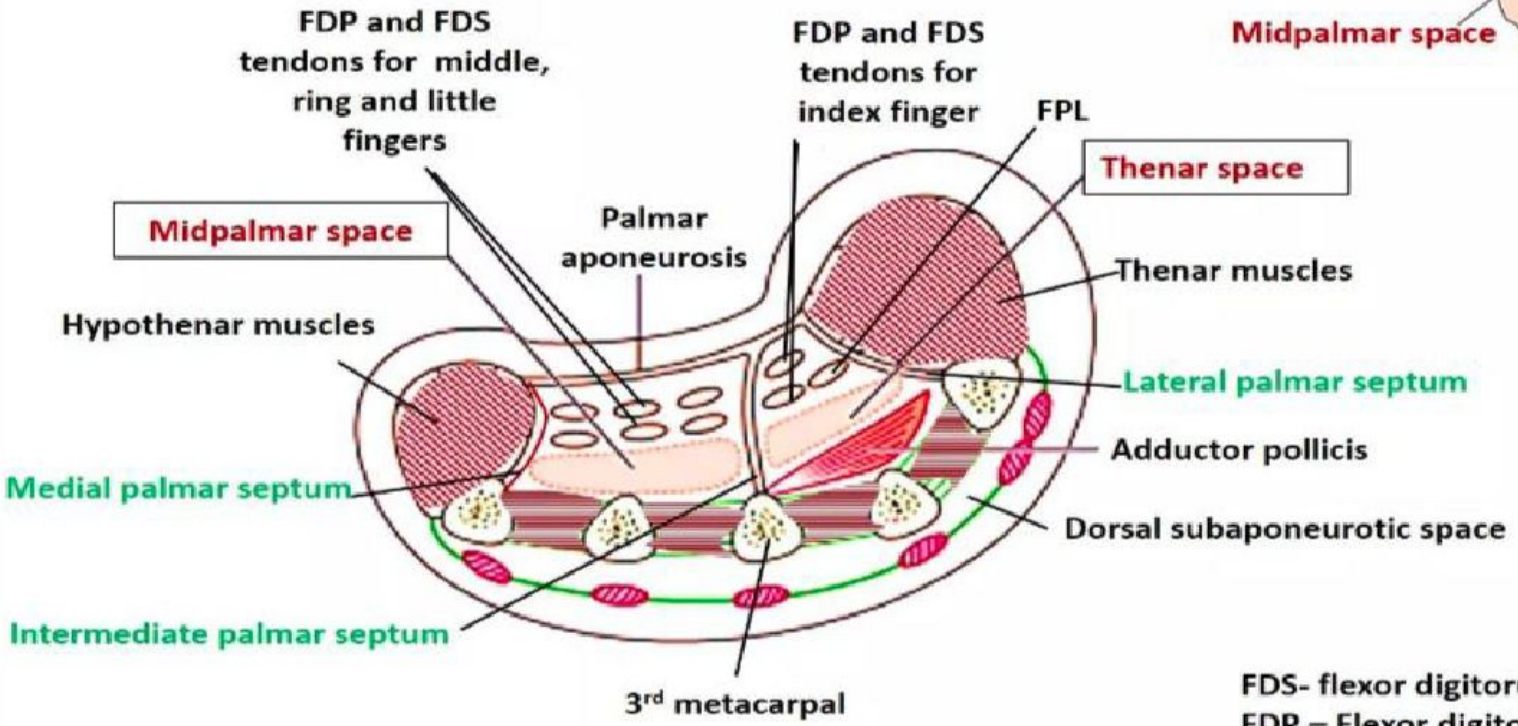
1. Topical anesthesia achieved with spray or infiltration.
2. Stab incision given through skin & s/c tissue.
3. If pus is not encountered, further deepening of surgical site done with sinus forceps.
4. Abscess cavity is entered and forceps opened in direction parallel to vital structures.
5. Explore the entire cavity for additional loculi.
6. Cavity irrigated with saline & antiseptic solutions.
7. Placement of drain.
8. Dressing.



Deep space infections

- • These **3 facial spaces** are:
- 1. **Hypothenar** space medially which contains hypothenar muscles.
- 2. **Thenar** space laterally which contains thenar muscles.
- 3. **Mid-palmar** space in between the previous 2 spaces.

Midpalmar and Thenar Spaces

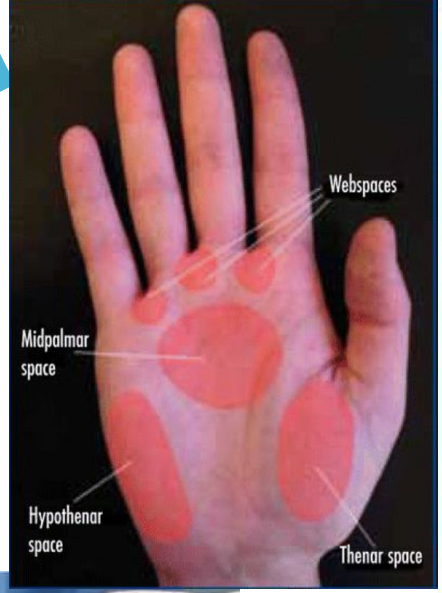


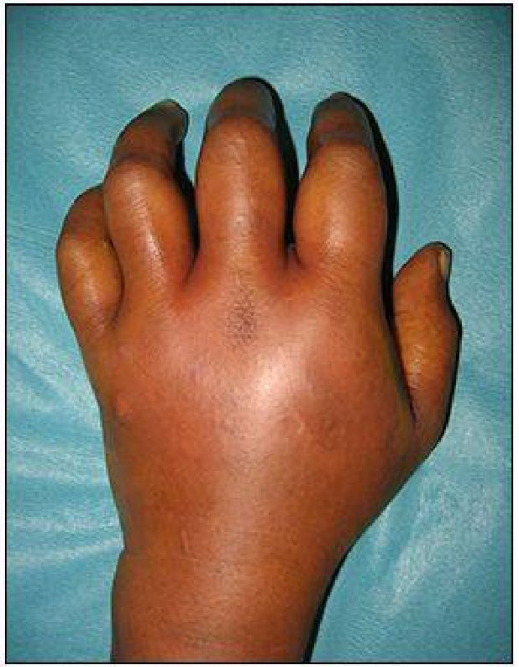
FDS- flexor digitorum superficialis
FDP – Flexor digitorum profundus
FPL – Flexor pollicis longus

- ⁎ **Anatomy of fascial spaces of the hand :**
- • The plam of the hand is divided into **3 fascial spaces** by:
- 1. **Medial fibrous spetum** extending from the medial border of palmar aponeurosis to the 5th metacarpal bone.
- 2. **Lateral fibrous septum** extending from the lateral border of plamar aponeurosis to the 1st metacorpal bone.
- 3. Intermediate fibrous septum extending from the mid plamar aponeurosis to the 3rd metacorpal bone.

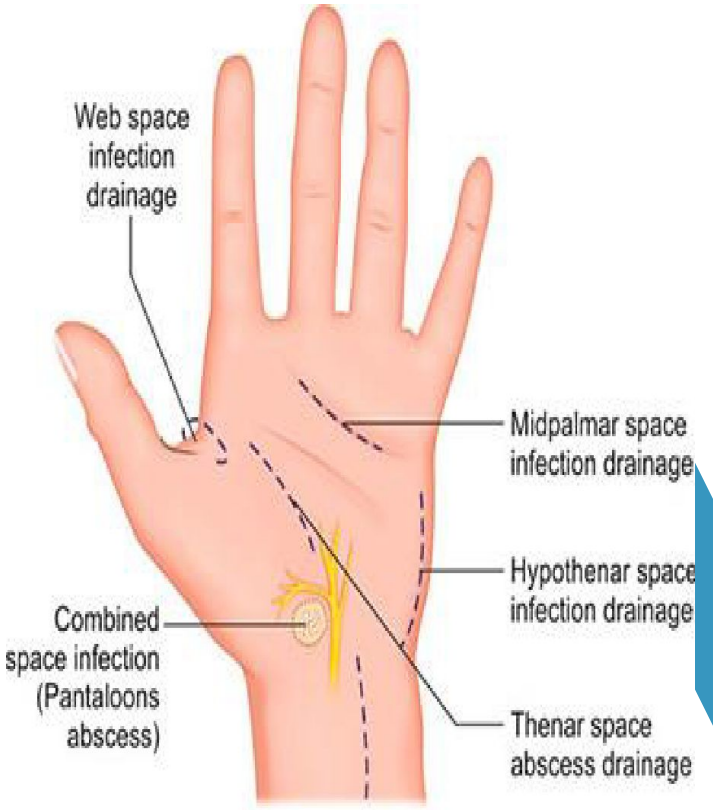
Midpalmar Space Infection

- **Aetiology:** Spread of infection from tenosynovitis or web space.
- ❋ **Clinical Picture**:
- 1. Severe pain, tenderness swelling hotness, redness in the middle of the palm **obliterating its concavity**.
- 2. Marked dorsal oedema (**frog's hand**).


Webspaces
Midpalmar space
Hypothenar space
Thenar space



- **Treatment:** (as usual)
- • Incision and drainage once pus is formed by a **transverse** incision in the skin only in one of the **transverse creases** of the palm followed by **Hilton's** method.



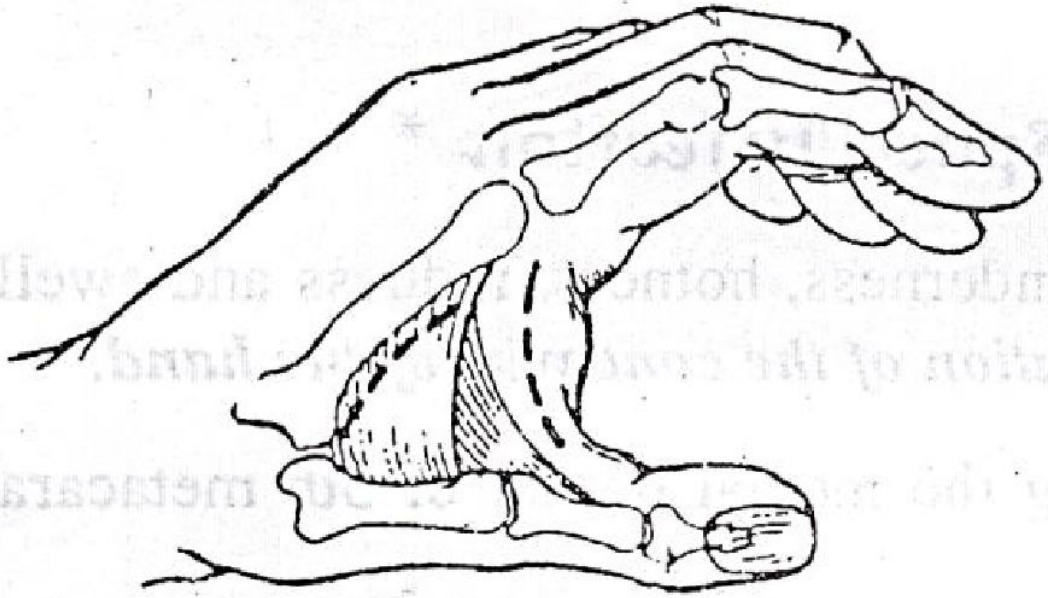
Hypotnenar Space Infection

- **Aetiology :** puncture wound in the hypothenar eminence .
- ⁎ **Clinical Picture:** Localized pain, tenderness, hotness, redness and swelling in the hypothenar eminence causing **accentuation** of the **concavity** of the hand.
- ⁎ **Treatment:** A longitudinal incision in the skin only along the **medial border of 5th metacarpal** bone followed by **Hilton's** method

Thenar Space Infection

- ⁎ **Aetiology :** puncture wound in the thenar eminence .
- ⁎ **Clinical Picture:** Pain, tender, red, hot, swelling with ballooning of **thenar eminence and accentuation** of the **concavity** of the hand.
- ⁎ **Treatment:**
- • Curved incision along **lat. border of 1st dorsal interosseous** muscle then introduce a closed sinus forceps along the **anterior surface** of **adductor pollices** muscle followed by **Hilton's** method.

- Incision along the **lateral border of the dorsum of the 2nd metacarpal** bone followed by **Hilton's** method.



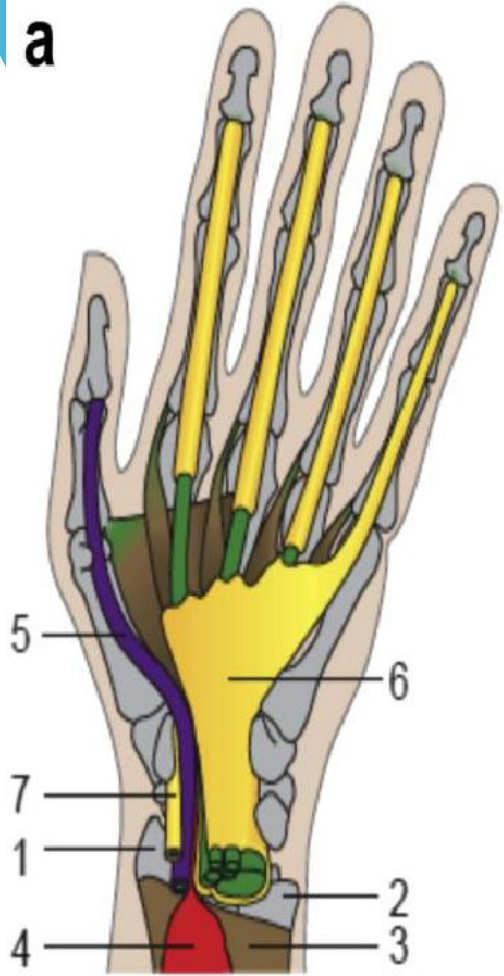
• Ir

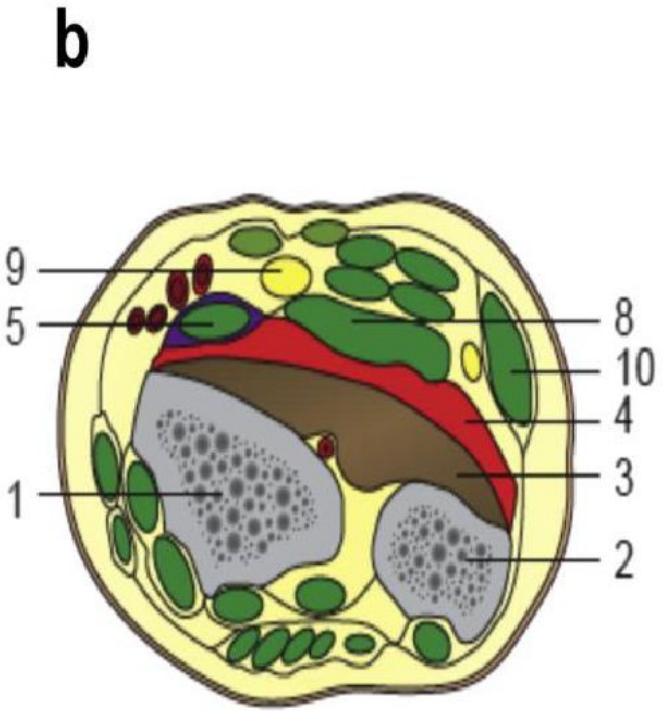
• Alternative incisions for thenar space infection.

Parona Space Infection

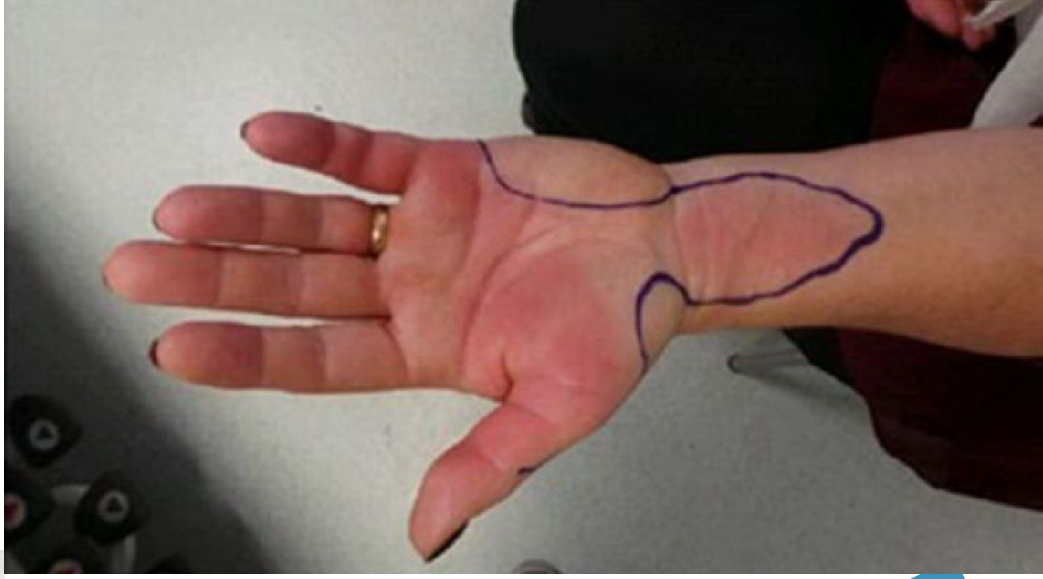
- ⁎ **Anatomy:** It is bounded posteriorly by pronator quadratus & anteriorly by ulnar and radial bursae. It communicates with mid-palmar space.

- **Aetiology : Usually spread** of infection from midpalmar space , ulnar or radial bursitis .
- ⁎ **Clinical Picture:** Pain, tender, red, hot swelling in the **distal part of front of forearm.**
- ⁎ **Treatment:** Drainage along the **ulnar side of forearm deep** to the flexor tendons & ulnar nerve & artery.





1. Radius
2. Ulna
3. Pronator Quadratus
4. Space of Parona
5. Flexor Pollicus Longus
6. Ulna Bursa
7. Flexor Carpi Radialis
8. Flexor digitorum profundus
9. Median Nerve
10. Flexor carpi Ulnaris




cms
0 1 2 3 4 5 6 7 8 9 10

Tenosynovitis

General

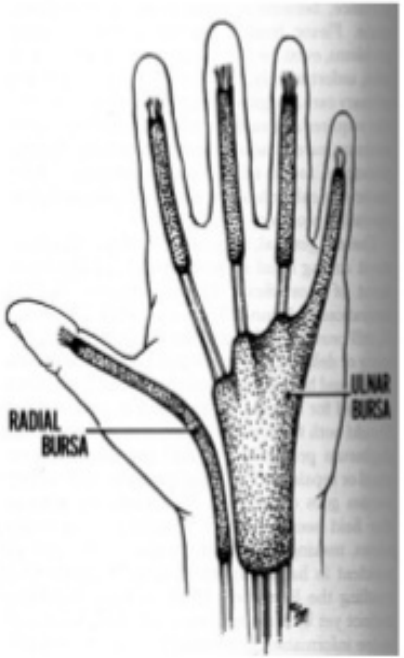
- Flexor sheath infections most often as a result of penetrating trauma
  - More likely at joint flexion creases
  - Sheaths are separated from skin by only a small amount of subcutaneous tissue here
- Also, Felons can rupture into the distal flexor sheath
- Usual causative agent: *S. Aureus*
- most commonly affected digits:
  - Ring, long & index fingers

Bursal Infections

- Usually due to spread of flexor tenosynovitis from thumb or small finger

- Radial bursa:
  - Proximal extension of tendon sheath of FPL
  - extends through the carpal tunnel into the distal forearm

- Ulnar bursa:
  - Proximal extension of tendon sheath of FDP of small finger



Acute Tenosynovitis Of Middle 3 Fingers

- ⁎ **Definition :** Acute inflammation of one of the flexor tendons and their synovial sheath .
- ⁎ Tenosynovitis is the **most serious** hand infections.

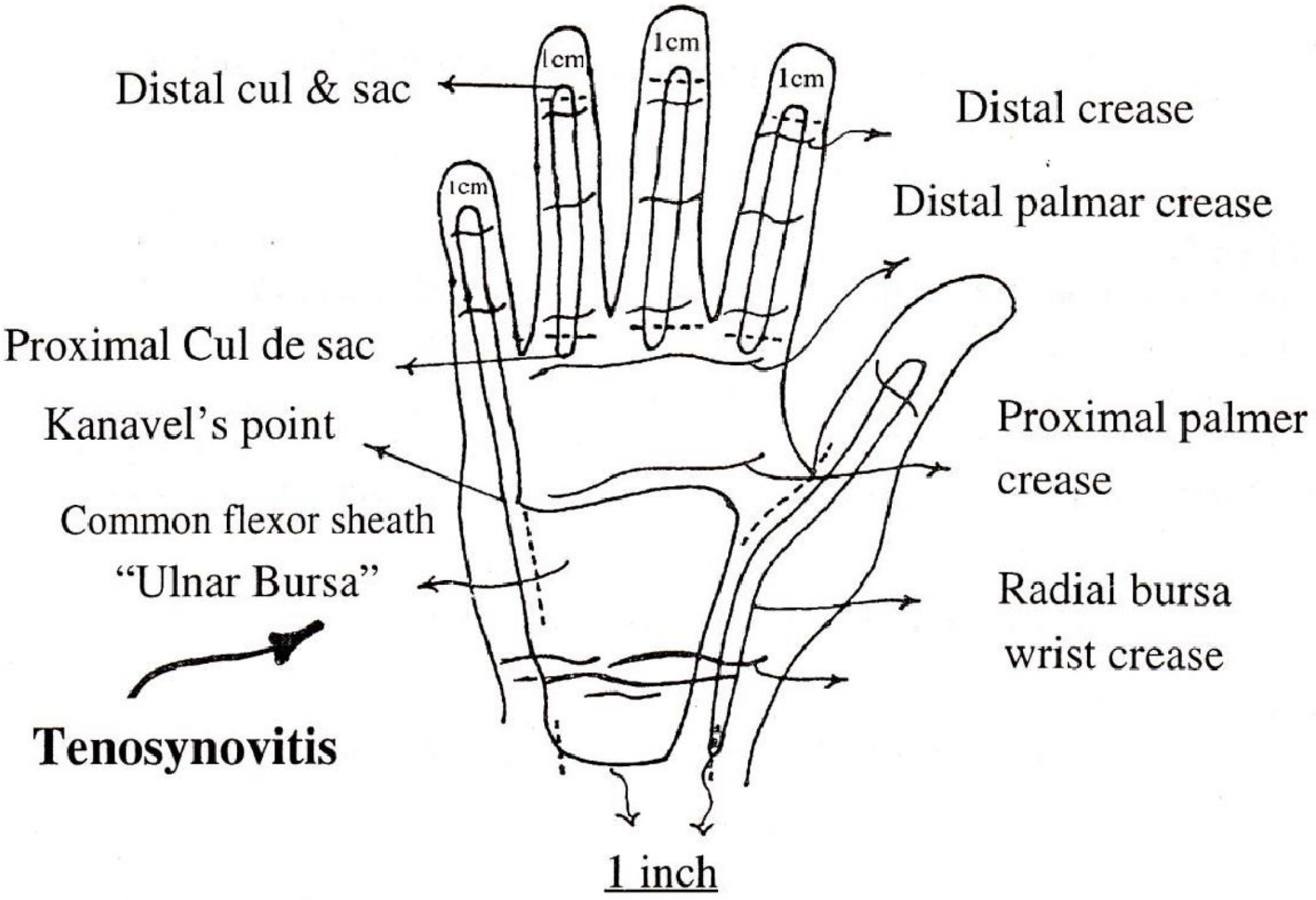
- **Anatomy of flexor synovial sheath :**
- • The synovial flexor sheath in the **middle 3 fingers** extend from the level of the **distal palmar crease** (opposite the head of corresponding metacarpal bones) to the **1cm distal** to the distal interphalangeal crease.
- • The synovial flexor sheath of the **little finger** extends proximally to be **continuous** with common flexor sheath which called the **ulnar bursa.**
- • The synovial flexor sheath of the **thumb** extends proximally to be continuous with the **radial bursa**.
- The **ulnar bursa** extends distally to the **proximal palmar crease** .

Tenosynovitis
Clinical

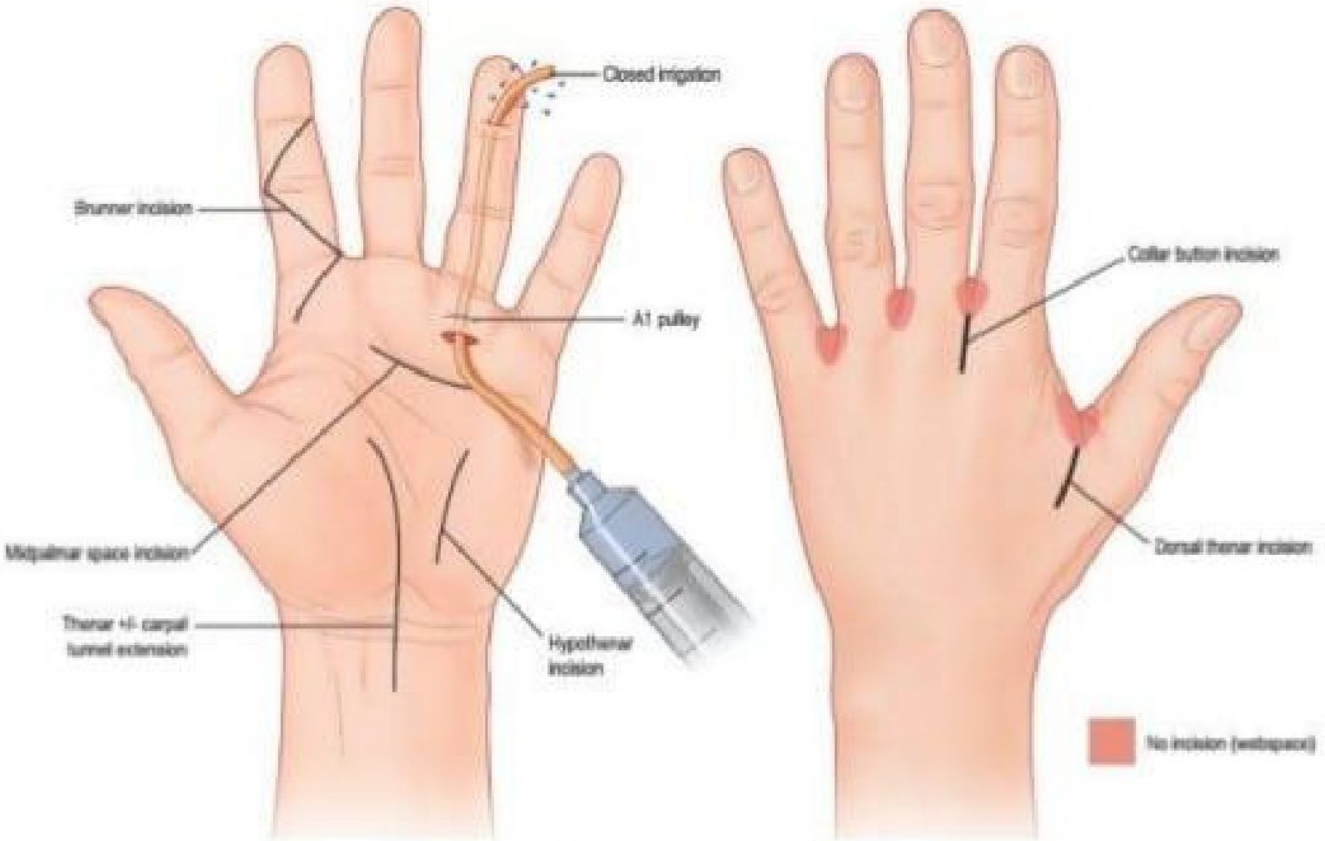
- Kanavel's 4 cardinal signs:
  - Tenderness over & limited to the flexor sheath
  - Symmetrical enlargement of the digit ("fusiform")
  - Severe pain on passive extension of the finger (> proximally)
  - Flexed posture of the involved digit

- Not all four signs may be present early on
- Most reliable sign: *pain w. passive extension*
- Cellulitis of the hand may appear similar, but swelling & tenderness is not usually isolated to a single digit

- ⁎ **Aetiology:** Usually due deep puncture wound.
- ⁕ **Clinical Picture:**
- 1- Swelling of the finger all around → **cylindrical finger**.
- 2- The affected finger is **semiflexed** with **limitation of movements**.
- 3- Pain & Tenderness: Max. over the **proximal cul-de-sac** (proximal end of the sheath).


Distal cul & sac
1cm
1cm
1cm
1cm
Distal crease
Distal palmar crease
Proximal Cul de sac
Kanavel's point
Common flexor sheath
"Ulnar Bursa"
Proximal palmer crease
Radial bursa
wrist crease
Tenosynovitis
1 inch

- Treatment:
- • Through a **transverse incision** in the distal palmar crease over the **proximal cul-de- sac**, then introduce a fine **catheter and irrigate** with antibiotic. In **severe** cases a counter incision can be done on the **distal cul de sac**.

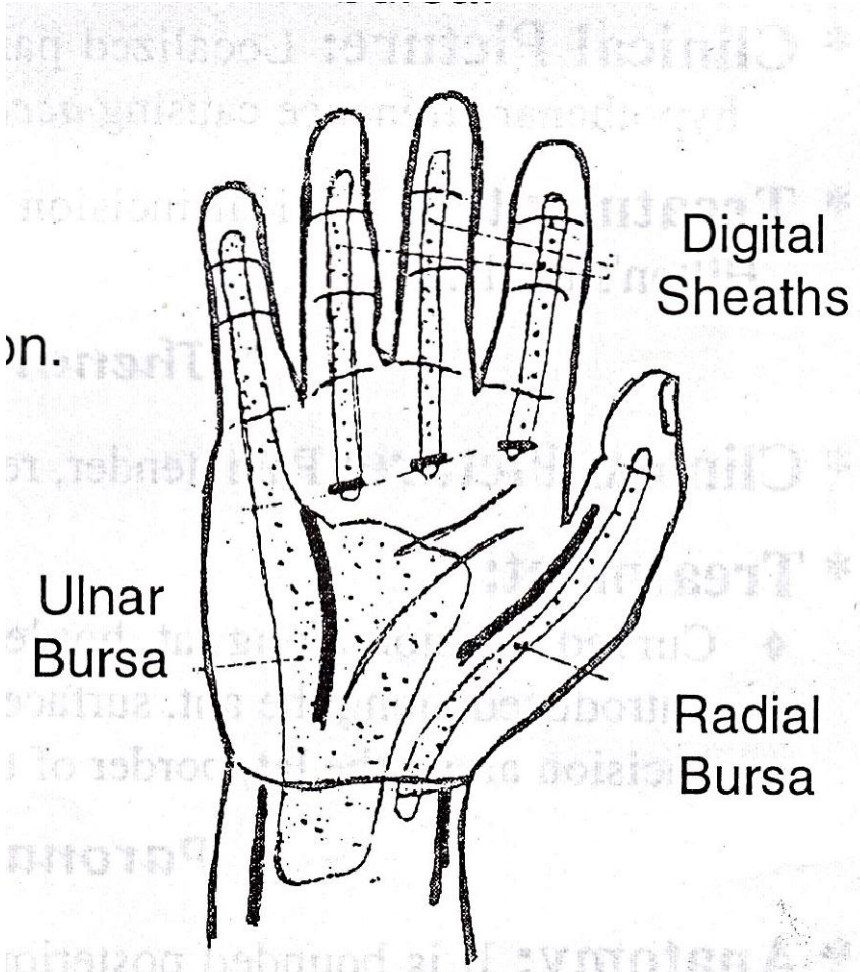


Incisions for Hand infection

Acute Tenosynovitis Of Little Finger and Ulnar Bursitis

- ⁎ **Definition:** It is a tenosynovitis of the commom flexor synovial sheath with involvement of the synovial sheath of the little finger.
- ⁎ **Aetiology:** Usually due deep puncture wound.
- ⁕ **Clinical Picture:**

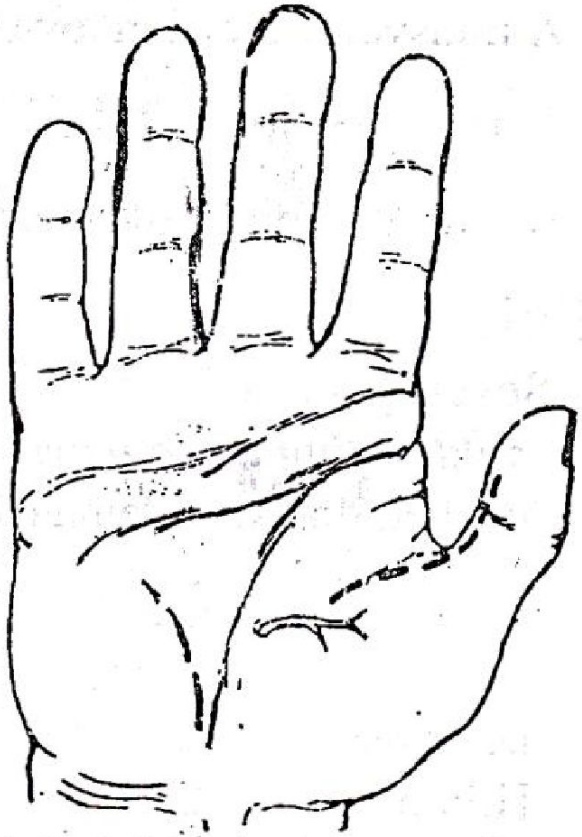
- 1- Swelling & oedma of the **whole hand**, especially the dorsum.
- 2- Pain & Tenderness: Over the ulnar bursa and the little finger. Maximum pain is present over the **kanavel's point** (point of meeting between the proximal palmar crease with the lateral border of hypothenar eminence).
- 4- There is limitation of movements of the **medial 4 fingers** with slight semiflexion.


Digital
Sheaths
Ulnar
Bursa
Radial
Bursa

- ⁎ Treatment:
- • Longitudinal incision along the **lateral border of hypothenar** eminence.
- • If extension of infection occur to the forearm → another incision is added along the **anterior surface of ulna**.

Acute tenosynovitis
Of thumb and radial bursitis

- **Definition:** It is a tenosynovitis of the flexor synovial sheath of the thumb .
- ⁎ **Aetiology:** Usually due deep puncture wound in the thumb.
- ❋ **Clinical Picture:**
- 1. Pain, tenderness & swelling of the thumb, thenar eminence extending to the distal part of forearm.
- 2. Limitation of movement & semiflexed thumb.
- ⁎ **Treatment:**
- • A longitudinal incision on the **medial border of the thenar** eminence **stopping** 2cm distal to the distal crease of the wrist to avoid injury of the motor branch of **median nerve**.
- • If extension of infection occur to the **forearm**: Longitudinal incision in front of radius along the **medial side of flexor carpi radialis**.



- Incision for drainage of radial bursa.

Human Bites

- Often undertreated & misdiagnosed leading to significant morbidity
- The most serious form of human bite infection is the clenched fist injury:

Any laceration over the head of a metacarpal is a human bite injury until proven otherwise

Human Bites

- The wound that results from a punch to the mouth may appear insignificant and treatment may not be sought for days.
- It often results in immediate inoculation of the subcutaneous tissue, the subtendinous space and the MCP joint with saliva
  - Human saliva may contain over 10^8 microorganisms per ml.
  - Over 42 species of bacteria identified
  - Thus: Polymicrobial infection is the rule
- Common organisms:
  - *S. Aureus, Strep sp.,*
  - *Eikenella*: gram neg facultative anaerobe in ~ 30% (incr. severity)

Human Bites

- Delay in onset of treatment is directly proportional to poor outcomes:
  - In general, human bites treated within 24 hrs. rarely have serious complications

- <u>in E.D.:</u>
  - Debride, irrigate, pack open
  - Abx to cover gram +'s & eikenella (Pen & Ceph)
  - +/- admission to follow response

- <u>To O.R.:</u>
  - Established joint space penetration, & more severe infections

Post Op Care

- Wound care & early initiation of therapy are key in achieving good functional results in treating hand infections
- In general:
  - wounds are debrided, irrigated & packed open
  - packing usually removed 24 - 48 hrs. post-op
  - initiation of regular wound cleansing
  - gentle active ROM
  - splints may be helpful in enhancing joint motions
  - early involvement of a hand therapist is important in achieving a good functional result.


THANK
YOU