

PLASTIC & RECONSTRUCTIVE SURGERY

LEC 1

5TH Stage

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اختصاص الجراحة التقيومية

HAND SURGERY

Basic Principle of hand management:

1. Tourniquets:

- *to achieve bloodless field.*
- *The pressure must exceed systolic pressure by about 100 mm Hg The duration of tourniquet application should be limited to about 1.5 to 2 hours. For a longer operation, the tourniquet should be deflated and the arm reperfused for 12 to 15 minutes per hour of ischemia to clear the acidosis.*
- ***Exsanguination of the arm with an Esmarch bandage before tourniquet inflation is contraindicated in the presence of infection or malignant tumors.*** *Intead, the limb should be elevated for several minutes for gravity to drain it of blood before the tourniquet is inflated.*

2. Anesthesia:

- *Surgery on the upper limb can be performed with a variety of anesthetic techniques. general, regional, or local infiltration.*
- *Use of local infiltration anesthesia is limited to small lesions.*
- *General anesthesia is usually indicated for children, for uncooperative patients, when multiple operative fields are required, and for long procedures.*
- *The most commonly employed regional anesthetic blocks are brachial plexus blocks, intravenous regional (Bier) blocks, median and ulnar wrist blocks, and digital blocks.*
- *Epinephrine is not recommended for any digital nerve block*

3. Magnification:

- *Good visualization is essential for atraumatic surgical technique. Loupes with $\times 2.5$ to $\times 3.5$ magnification are ideal for most upper extremity surgery.*

4. Elective Incisions and Wound Extensions:

- ***To avoid contracture, incisions must not cross skin flexion creases at joints.***
- *The two most useful incisions in the finger are the midaxial and the Bruner, or zigzag, incisions.*
 - *The midaxial incision gives access to both volar and dorsal structures .*
 - *The Bruner incision is only for the palmar surfaces and crosses volar skin between flexion creases in a zigzag fashion.*

5. Wound Closure:

- *Incisions and wounds of the hand can generally be closed with a single layer of interrupted sutures. Vertical mattress sutures are needed if the skin edges tend to invert.*

- *Lacerated wounds that cross flexion creases need reorientation by Z-plasties. Except in areas of unavoidable tension, such as posterior to the elbow, sutures are removed after 7 to 10 days to minimize suture marks.*

6. Elevation :

- *An accidentally or surgically injured limb should be continuously elevated until effective pumping activity is again functioning to propel venous blood and lymph back to the body.*
- *The heart is the point of reference for elevation. While walking, the patient should hold the hand over the contralateral shoulder or even rest it on the head.*
- *Slings tend to promote edema by holding the hand at the level of the umbilicus, which is lower than the heart. In the sitting position one should prop the elbow on a table with the hand upright and at night one should rest the hand on pillows or on the chest.*

7. splinting:

- *When immobilization is essential, it should be in the "protective" or "safe position." This keeps ligaments under maximum stretch to prevent their shortening and subsequent restriction of joint mobility.*
- *There are just three essential elements of the protective position. interphalangeal (IP) joint extension, metacarpophalangeal (MCP) joint flexion, palmar abduction of the thumb and slight extension of wrist.*
- *Either a splint or a cast can be used to immobilize the hand .*

8. Dressing: *The basic hand dressing consists of three layers.*

- *The first layer is flat, with slightly moist gauze applied directly to the wounds.*
- *The second layer is fluffed gauze placed between the fingers to prevent skin maceration and to cover potential pressure points, such as the ulnar head.*
- *The third layer is a 2- or 3-inch roll gauze applied circumferentially to hold the other layers in place but with diminishing pressure from distal to proximal to promote venous return. The original dressing placed in the operating room is left on until suture removal unless there is a specific indication to remove it sooner.*

9. Antibiotics:

- *The role of postoperative oral antibiotics in routine elective soft-tissue procedures (i.e., carpal tunnel release, trigger finger release, etc.) remains controversial with no clear benefit.*
- *Infection ,use of implant (as in staged tendon graft) ,soft tissue surgery >2 Hrs and Injuries or surgeries involving open fractures or other bony work need perioperative IV antibiotic coverage.*

10. Movement and rehabilitation :

- *Because prolonged immobilization can lead to stiffness of small joints, immobilization should be maintained where essential for minimal time while continued movement of other parts is encourages*

HAND INFECTIONS

MICROBIOLOGY

Staphylococcus aureus is the most common pathogen.

Streptococcus spp are the next most common pathogens.

Immunocompromised hosts are more likely to have gram-negative anaerobes or unusual organisms cultured.

MEDICAL CONDITIONS WITH INCREASED RISK:

Diabetes mellitus

Immunosuppressive conditions

- AIDS
- Major debilitating medical conditions (e.g., liver disease, hematologic disease, or neoplasms)
- Transplant patients
- Patients with autoimmune disorders

Alcohol and drug abuse

Malnutrition

Renal failure

Occupational or other behavioral factors that increase risk

- Dentists, dental hygienists, or others exposed to oral secretions: **Herpetic whitlow**
- Dishwashers: **Chronic paronychia**
- Nail biting: **Paronychia**

❖ **If hand infection are not treated promptly, tendon adhesion, necrosis and even reapture, stiffness, and loss of function will ensue**

EVOLUTION AND BASICS OF TREATMENT

History

- There is almost always a history of minor trauma, such as a splinter, penetrating injury, or a bite.
- Look for a history of systemic disease such as diabetes.
- Determine tetanus status.

Physical Examination

- Expose and examine the entire upper extremity.
- Notice discoloration, edema, discharge, or lymphatic streaking; palpate for swelling, lymph node enlargement, or temperature change.
- Compare results with opposite extremity, using it as a control.

Radiology

- At minimum, obtain radiographs.
- Ultrasound, CT scan, and/or bone scan may be considered in specific situations.
- MRI (with contrast) is most useful to evaluate for fluid collection.

Surgical Principles

- Tourniquet should be used but **only with gravity exsanguinations**, because Esmarch wrapping may predispose to bacteremia.
- Surgical drainage is performed through large incision(s) that may be extended in almost any direction.
- Avoid longitudinal incisions across a flexion crease.
- Minimize exposure of blood vessels, nerves, and tendons if possible.
- Excise all necrotic tissue.
- Intraoperative cultures (Gram stain, aerobic/anaerobic/acid-fast bacilli [AFB]/fungal cultures)
- Copious irrigation: Best done with large saline bag via gravity and cystoscopy tubing
- Most wounds left open with moist gauze and/or wick
- Loose dressings and splint
- Early mobilization
- Rest, heat, and elevation are important adjuncts to surgical treatment of hand infections

I. **Cellulitis and lymphangitis:** all hand infection is begin as cellulitis.

- cellulitis is non-suppurative superficial infection of skin. there is poor localization in addition to the cardinal sign of inflammation i.e. redness, hotness, swollen ,pain and tenderness Usually by *S. aureus* or group A streptococcus. Systemic sign and symptoms like fever, chill ,tachycardia follow the realese of exotoxine and cytokines into circulation. Cellulitis is usually located at the point of injury and subsequent tissue infection.

- Lymphangitis is part of a similar process and present in painful red streak in affected lymphatic usually accompanied by painful lymph node groups in the related drainage area

Treatment: The vast majority of cases will respond to oral antibiotics, rest, warm soaks and elevation. Because gram positive organisms are typically responsible, first generation cephalosporin or antistaph penicillin is appropriate e.g. flucloxacillin

II. **Paronychia:** an infection of the soft tissues surrounding the fingernail .

- ❖ When infection involves the proximal nail and one lateral fold, it is known as an eponychia.
- ❖ When an abscess dissects under the nail sulcus to the opposite lateral fold, it is known as a “runaround” abscess

1. Acute infection

➤ Etiologic factors

- **Most common infection type of the hand**
- Associated with nail biting, poor manicure technique, or minor trauma
- Usually *S. aureus*, occasionally anaerobes

➤ Diagnosis

- Patients present with pain, redness, and swelling around the nail.
- Patients occasionally report drainage of pus.

➤ Treatment

- ✓ Early treatment: Warm soaks, oral antibiotics, rest.
- ✓ Later treatment: Drainage of abscess..
- ✓ Prescribe oral antibiotics for 5-7 days (Bactrim, clindamycin, or doxycycline).
- ✓ If unresponsive to oral antibiotics, consider IV antibiotics (vancomycin or clindamycin).
- ✓ Start hydrotherapy in 24 hours at least twice a day.
- ✓ If purulence is below nail plate, partial or complete nail plate removal may be required.

2. Chronic infections

➤ Etiologic factors

- **Usually fungal (*Candida albicans*)**, occasionally *Pseudomonas* spp, or atypical mycobacteria
- Associated with diabetes and chronic exposure to moisture (dishwashers, cafeteria workers)

➤ **Diagnosis:** Indurated, erythematous eponychium .May have intermittent drainage, often a cheesy consistency

➤ **Medical treatment:** topical antifungal and steroid preparations

➤ **Surgical treatment: Eponychial marsupialization** when conservative treatment fails(A crescent-shaped portion of skin, proximal to eponychial fold, is excised and Granulated tissue is removed. Then Wound is allowed to close by secondary intention.

III. **Felon:** An abscess of the pulp of the thumb or fingertip.

- **Because of the unique anatomy of the pulp, with 15 to 20 longitudinal septa anchoring the skin to the distal phalanx, the pulp is divided into multiple closed compartments. Abscess formation within these small closed compartments results in rapid development of swelling and throbbing pain.**

➤ Etiologic factors

- Typically, a felon occurs after a puncture wound.
- *S. aureus* is the most common pathogen.
- Gram-negative microbes are possible, particularly in immunocompromised patients.

➤ Diagnosis

- Patients have a **red, swollen, fluctuant fingertip** that is exquisitely tender.
- Patients often have throbbing pain that keeps them up at night.

➤ Surgical treatment

- For an obvious pointing abscess, **open longitudinally over the point of maximum fluctuance.**
- Otherwise use a **lateral incision over the midaxial line:** Ulnar for the index, middle, and ring fingers, but radial for the small finger and thumb.

➤ **Complications** of untreated or inappropriately treated felon:

1. painful , unstable , insensate , unaesthetic scar.
2. acute flexor tenosynovitis
3. septic arthritis.
4. osteomyelitis.
5. deep space infection.
6. amputation.

IV. **Pyogenic (Suppurative) Flexor Tenosynovitis:** An abscess within the flexor tendon sheath

➤ **Etiologic factors**

- *S. aureus* is the most common pathogen.
- Usually a history of penetrating trauma; may occur as extension of a felon
- Rarely caused by hematogenous spread (suspect gonococci)

➤ **Diagnosis: Kanavel's four cardinal signs**

1. Pain on passive extension of the finger (earliest and most reliable sign of the four)
2. Fusiform swelling of digit
3. Tenderness over flexor tendon sheath
4. Partially flexed posture of digit (added later to original description)

➤ **Treatment:**

- Early cases of flexor tenosynovitis (i.e., less than 48 hours into the process) may respond to conservative management, including intravenous antibiotics, rest, heat, and elevation.
- Failure to respond within 24 to 48 hours warrants immediate operative intervention.
 - ✓ Less severe cases may be treated with a limited incision and catheter irrigation technique.
 - ✓ Severe cases, Bruner-type incision over the entire course of the flexor sheath. The wound is packed open.
- Early and aggressive hand therapy is indicated for all cases.

V. **Herpetic Whitlow:** A **herpes simplex** infection of the hand

Usually self-limited, 2- to 3-week course

➤ **Etiologic factors:** Herpes simplex virus types 1 and 2

- **HSV type 1** more commonly affects young children and the medical and dental professionals in contact with saliva.
- **HSV type 2** infections have been more common in adults.

➤ **Diagnosis:**

- **The distinction is made primarily from the history. Herpetic whitlow usually presents with a prodromal phase of 24 to 72 hours of burning pain prior to the development of skin changes.** This is followed by erythema and swelling, then the formation of clear vesicles. The pulp is not as tense as with a felon.
- The diagnosis may be confirmed by viral culture or Tzanck smear.

➤ **Treatment** is conservative and includes rest, elevation, and anti-inflammatory agents

- ✓ **Acyclovir** is used in severe cases, or for immunocompromised patients at risk for a life threatening Viremia).
- ✓ incision and drainage of herpetic whitlow is generally contraindicated unless there is 2ndry infection.

VI. **Deep Space Infection:**

Etiologic factors : These typically occur after a puncture wound or other penetrating injury. *S. aureus* is the most common pathogen

❖ **Deep spaces within the hand (dorsal Subaponeurotic space, Thenar space ,Midpalmar spac, Hypothenar space ,Interdigital spaces, Parona's space).**

- **The thenar eminence** is the most common region for deep space infections to occur. **Diagnosis:** Pain exacerbated by flexion or opposition of the thumb redness, and swelling over affected area,. **Management** includes incision and drainage of the region (combined dorsal and volar incision)
- **Midpalmar space** *Pain on flexion of ulnar three fingers, loss of volar concavity* redness, and swelling over affected area. **Treatment** preferred to do curved longitudinal incision in the palm with care to avoid injury to superficial palmar arch and digital vessels.
- **Parona's space** (the potential space between the pronator quadratus and the flexor tendons) serves as a bridge between the radial and ulnar bursae and allows the formation of "**horseshoe**" abscesses
- **Web Space Abscess (Collar-Button Abscess):** The subfascial palmar space communicates with the dorsal subcutaneous space through the web spaces between the digits .Infections in this subfascial space spread dorsally through the web spaces and are commonly referred to as collar-button abscesses or hourglass abscess. **Diagnosis:** Presentation with pain, redness, and swelling over affected area and *Abducted posture of adjacent fingers* treated by dorsal and volar incisions. Preferred not to cross web space to prevent contracture.

VII. **Bites:**

Classified according to source: Human or animal

❖ **Human**

➤ **Etiologic factors**

- ✓ Bites are most common over the ring and small-finger metacarpal head (*fight bite*)
- ✓ Most of these infections are polymicrobial
- ✓ Organisms include: *Streptococcus viridians*, *S. aureus*, *Bacteroides* spp and *Eikenella corrodens*

➤ **Diagnosis**

- **The hand must be examined with the fingers fully flexed** to reproduce the orientation of skin, tendons, and joints at the time of impact.
- **Radiographs are essential.** Look for a tooth fragment, metacarpal head fracture, or air in the joint.

➤ **Treatment**

1. Explore wound in the operating room.
2. Irrigate the joint and debride wound edges.
3. Allow to close by secondary intention or after 7 days of dressing changes.
4. IV antibiotics (*Eikenella corrodens* is sensitive to penicillin and to clindamycine.), splinting, and elevation.
5. Start hand therapy after 48-72 hours.

❖ **Animal (dog and cat bites)**

➤ **Etiologic factors**

- **Dog bites are the most common.**
- **Cat bites are more likely to cause an abscess**, because their long, thin teeth are more likely to cause puncture wounds.
- Dog and cat bites are more likely unimicrobial with cat bites having a high likelihood of *Pasteurella multocida* infection
- Both bite types require coverage for *Pasteurella multocida*, as well as *Staphylococcus* spp, *Streptococcus* spp, and anaerobes.

➤ **Diagnosis**

- Determine tetanus status and investigate the possibility of rabies.
- Cat bites may cause **cat-scratch fever**.

• **Treatment**

- Irrigate all wounds thoroughly.
- Explore joints, when indicated, as for human bites.
- For dog bites, loosely approximate and sharply debride skin edges.
- Substantial bite injuries may benefit from splinting and hand therapy.
- Cat bites rarely require closure.
- Antibiotics: IV.