Hand injuries

Metacarpal injuries

The metacarpal bones may fracture through the base, shaft or the neck.

- **Shaft fractures**: these are caused by direct trauma which may cause transverse # of one or more metacarpal bone OR it is caused by twisting injury which cause spiral #. Clinically the patient complains from pain, swelling sometime there is dorsal hump.

  **Treatment**: **undisplaced** or slightly displaced # needs 3 weeks back slab over forearm to the affected finger only. **Displaced #** needs closed reduction & 3 weeks back slab or closed reduction & percutaneous pinning with K-wires. **Spiral #** may rotate; they need closed reduction & percutaneous pinning or open reduction & internal fixation with plate & screws.

- **Neck #**: usually that of the 5th metacarpal, it is called Boxer’s # because usually it occurs during boxing. Clinically there is flattening of the knuckle.

  **X-ray** show transverse # of the neck with volar angulation of the distal fragment.

  **Treatment**: Closed reduction & 2 weeks gutter splint or back slab (the metacarpophalangeal joint flexed & Interphalangeal joint extended). Unstable # may need percutaneous. K-wire fixation. *the accepted deformity for 4th & 5th metacarpal is 40° and 20° for the 2nd & 3rd.*

Boxing **flat knuckle**
**Base #:** usually stable # need 3weeks splint.

**First metacarpal fracture**

1- **Impacted #:** it is transverse # 6mm distal to CMJ with adduction deformity. **Treatment:** if the angulation less than 30 degrees, this need 3weeks thumb spica. If the angulation more than 30 degrees then closed reduction & thumb spica or percutaneous K-wires.

![Image of metacarpal fracture and treatment options](image)

2- **Bennett's fracture-dislocation:** oblique # of the base of the 1st metacarpal extending to carpometacarpal joint. Clinically the thumb look short, adducted & there is tenderness at carpometacarpal region.

![Image of Bennett's fracture-dislocation](image)

**X-ray:** a triangular fragment remains with trapezium while the thumb subluxate proximally by the pull of the abductor pollicis longus muscle.

**Treatment:** perfect reduction is essential this can be achieved closed by traction; the reduction is then held by either cast or by percutaneous K-wire, if this fails then open reduction & internal fixation by screw.

3- **Rolando's fracture:** comminuted intra articular fracture of the base of the thumb metacarpal with T or Y configuration. **Treatment:** this include closed reduction & percutaneous K-wire fixation or open
reduction & mini-screw fixation, in severely comminuted # ligamentotaxis using external fixator.

Fractures of the phalanges:

Are common; improper treatment may result in a stiff finger which may be worse than no finger. These are caused by direct force, there may be open wound.

**Proximal &middle phalanx:** *Undisplaced* # needs 3 weeks 'buddy strapping.

*Displaced* # needs closed reduction & buddy strapping (if stable) or malleable splint. If unstable needs closed reduction & percutaneous K-wire or ORIF using K-wires or mini plate.

**Terminal phalanx fractures:** MOI: blow by hammer or catch in a door.

- **Tuft #:** disregard the # and concentrate on regaining movement.
- **Subangual haematoma:** if painful, can be drained by piercing the nail by needle.
- **Shaft #:** if undisplaced disregard the # if displaced then closed reduction or open reduction & k-wire
Tuft # Subungal hematoma piercing the nail by needle

➤ **Mallet finger**: a sudden flexion injury (stubbing) may avulse the extensor tendon sometime with bone fragment from the base of distal phalanx. **Clinical features**: drop terminal phalanx & can't be actively extended. **Treatment**: slight hyperextension of DIPJ by mallet finger splint for 6 weeks; sometime, need K-wire fixation.

Dislocations of the hand

These include:

I. **Carpometacarpal dislocation:**

Thumb CMJ dislocation: usually dorsal dislocation, this need closed reduction & splint or K-wire. Other CMJ dislocation (motorcyclist's injury), also dorsal dislocation & need same treatment.

II. **Metacarpophalangeal dislocation**
Usually dorsal; either simple dislocation need closed & strapping. Or complex dislocation with entrapped volar plate usually closed reduction fails so open reduction & splint.

III. Interphalangeal dislocation: usually dorsal dislocation of the PIPJ usually needs closed reduction & buddy strapping.

**Ligament injuries:**

- **Finger collateral ligament injury:** it is caused by forced angulation which leads to partial or complete tear, this require 10 days splint; if bone fragment avulsed, it may need k-wire fixation. The joint swelling may persist for 6-12 months.

- **Gamekeeper's thumb** (skier's thumb): falling on the thumb with hyperabduction may cause partial or complete tear of ulnar collateral ligament of the thumb MPJ.

  **Clinical features:** there is pain & swelling on the ulnar side of the thumb MPJ, if complete tear: the thumb is unstable with laxity on passive MPJ abduction.

  **Treatment:** Partial tear needs 4 weeks splint. Complete tear needs operative ligament repair & 6 weeks splint.
Open injuries of the hand:
these include: 1-clean cut; 2-laceration; 3-crush; 4-injection injury; 5-burn; 6-finger tip injury.

- **Assessment:** look for: mechanism of injury, skin damage, circulation, sensation, tendons, x-ray: fracture or foreign body. Test for the tendons: flexor digitorum profundus (FDP) → keep the PIPJ & ask the patient to flex the DIPJ. Flexor digitorum superficialis (FDS) → keep all fingers extended except one & ask him to flex the PIPJ.

- **Treatment:** start AB & anti-tetanus, clean the wound with sterile crystalloid solution & cover it with iodine-soaked dressing. In the theater: explore & clean the wound; incisions to extend the wound should not cross skin creases. All dead tissues excised & foreign bodies removed; rewash the wound & reassess the injury and then start tissue repair: 1-fractures is reduced & fixed with K-wires; 2-repair torn ligaments; 3-ligate or repair vessels; 4-repair cut nerves; 5-repair extensor tendons;

6-flexor tendons repair: use core & circumferential sutures to start 'protected early movement' especially in the zone II-'no man land'-where the two tendons (FDP & FDS) pass in the same flexor sheath. The A2 & A4 pulleys should be repaired to avoid tendon bowstring.
**Closure:** clean wound is closed or skin grafted; bare tendon or bone is covered by flap

**Splintage:** after dressing the hand must be held in the 'position of safety' = position of function: extended wrist (20°), flexed MPJ (70-90°), almost straight IPJ & abducted thumb; In cases of tendons injury, use special splints like dynamic or elastic-band splint.

![Position of safety]

**Postoperative care:** hand elevation & start supervised exercise till healing.

**Finger tip injuries:**

These usually result from a cut wound, the treatment depends on the age & whether the bone exposed or not.

> If the bone not exposed → skin graft.

> If the bone exposed →

1- advancement flap; V-Y plasty.

2- cross-finger graft;

3- neurovascular island flap; or

4- Bone shortening 'terminalization'.

5- In children this requires dressing only.

![V-Y Plasty]
Replantation

Amputated thumb or digit can be replanted & this requires microsurgery in special center, the warm ischemic time is 6 hours, the cold ischemic time is 30 hours. The amputated digit should wrapped in sterile gauze, placed in a plastic bag which is placed in a watery ice.

*Replantation of the thumb*

**Indications:** (1) thumb should be replanted as it comprise more than 50% of hand function,(2) multiple digits in adult (3) single digit in children (4) proximal amputation through the palm, wrist or the forearm(5) amputation distal to the insertion of the proximal digitorum superficialis.

**Contraindications:** (1) single digit in adult (2) severely crushed or avulsed part (3) long ischemic time (4) general medical disorders & other more urgent injuries.

Late reconstruction

Patients presented late with amputation of the thumb or the digit a reconstruction can be done:

I. If the thumb lost & the other digits are present, a new thumb can be reconstructed
   - Pollicization, by rotating one of the digits to oppose the others.
   - Microsurgical transfer of the second toe.
   - Osteoplastic reconstruction by using a cortical bone graft surrounded by skin flap.

*Pollicization of index*  
*Microsurgical transfer of the second toe*
II. If the thumb present but all the other digits are lost then a new digit can be reconstructed by:

- Microsurgical transfer of the second toe.
- Osteoplastic reconstruction by using a cortical bone graft surrounded by skin flap.

*Osteoplastic reconstruction*