

Hand injuries.

The hand is the most commonly injured part of the anatomy. Between 20-35% of most reported injuries were to hands and 20-30% of compensation payments are for hand injuries.

Causes of hand injuries

Industries

1. Machinery
2. Hand tools
3. Glass
4. Falling objects
5. Explosives
6. Burns

Home accidents

1. Glassware
2. Burns
3. Cutting tools
4. Knives
5. Domestic machinery.

Surgical anatomy

1. Posture

- Posture of the hand at rest (position of rest)

2. The skin

- Palmar skin is thick and cornified for enhanced grip. The dorsal skin on the other hand is thin, mobile and elastic to accommodate extension.

3. Blood Vessels

- Each finger is supply by two digital arteries each in close proximity to its eponymous nerve. Hence they may be injured together.
- When one of the two main digital arteries remains intact in injuries to the fingers, the finger remains viable. When both are injured, gangrene occurs.

4. The Nerves

- Cutaneous supply is by branches of the ulna, median and radial nerves. There is a lot of overlapping between the part of the skin supplied by each nerves and also great variations in the pattern of supply in the population.
- All the intrinsic muscles are supplied by the ulna nerve except the thenar muscles.

5. The tendons

- There are 12 extrinsic flexor tendons in the hand and the wrist.
- 3 insert at the wrist
- there are 9 flexors of the digits (one for each I-P joint)
- At the mid-palm, each of these tendons enters a synovial tendon sheath. The two tendons of the 2nd-5th fingers have a common sheath.
- Flexor tendon injuries of the hand can be classified according to their location in zones that corresponds to anatomical areas of the hand.

Zone I: The FDP has emerged from beneath and between the decussating fibres of the FDS and travels to it's insertion in the terminal phalange. Immediate repair of the tendon should be done.

Zone II: this is where the 2 flexor tendons occupy the fibro-osseous tunnel at the mid-palm level.

Repair here is very difficult and the outcome usually poor. In fact this area is referred to as the “no man’s land”.

Zone III: this is at the mid-palm level. The tendons are free of sheath, but they are in close proximity to vital structures such as the superficial transverse vascular arch, the terminal sensory divisions of the median nerve and the motor divisions to the thenar muscles.

Zone IV: The carpal tunnel. Injuries here usually involve many tendons.

Zone V: At the level of the wrist. Common, and may be self-inflicted. Major nerve and vascular injuries are common associated injuries. Results of tendon repair here are usually good.

- The *extensor tendons* are arranged in 6 compartments beneath the extensor retinaculum. They form an extensor expansion on the dorsum of each finger which together with the intrinsic muscles acts to effect extension of the digits.

6. The joints

- Each finger has two IP joints. (The thumb has one). The ligaments of IP joints are tight in extension and lax in flexion.
- In contrast, those of the MP joints are lax in extension and tight in flexion.

Clinical Management

History

A) Mechanism of injury:

1. How was it sustained?
2. How long ago?
3. What position was the hand in at the moment of injury?
4. Was a tool involved and if so, was it a powered tool?
5. What was the potential for contamination
6. Which is the dominant hand?

B). When was the last meal taken?

C). Past medical history.

D). Current medications.

Clinical Examination

This is best carried out in two stages:

A) Pre-anaesthetic examination in the casualty preliminary to operation. This concerns the whole hand and its function. Wound examination at this stage is basically to estimate its size, location and probable tissue injured.

B) Operative assessment (examination under anaesthesia): this is concerned with the details of the wound itself.

Pre-anaesthetic examination

1. *Circulation:* this is the first priority. Check for persistent copious bleeding (unusual), colour, warmth, and turgor. Determine capillary filling.

2. Assessment of *sensory nerve* function.

- a. Assessment of sweating (pen test)
- b. Cutaneous sensation
- c. immersion test.

3. Assessment of *motor function* of the Ulna and Median nerves.

4. Assessment of *tendons*

- a. Posture at rest
 - b. Posture with the wrist flexed.
 - c. Wrist tenodesis test: Alternatively flex and extend the wrist while observing the positions of the fingers. In a normal hand with intact tendons, the fingers go into flexion when the wrist is extended and go into full extension when the wrist is flexed
 - d. Test for individual tendon action
5. Assessment of *bone and joint*.
- a. deformity
 - b. Local tenderness

Investigations

1. Radiology
2. Wound culture
3. Doppler flow meter
4. Florescein dye test
5. Compartmental pressure measurement.

Treatment

First aid

- Control haemorrhage with compressive dressing.
- Cover the injured hand with clean dressing
- Adequate splinting: Buddy strapping can be used for the fingers.

Casualty Reception

- Quick history and examination.
- Carry out the first aid actions if they had not been done.
- Calm (Reassure) the patient
- Analgesics
- IV fluid
- Tetanus immunoprophylaxis
- Antibiotics when indicated.
- Investigations especially X-rays.

Definitive Treatment

This can be carried out in the emergency room theatre in cases of minor injuries otherwise it should be done in the main operating theatre suit. Requirements include adequate anaesthesia. Tourniquet should always be used except when contraindicated.

Types of anaesthesia

- Axillary block
- Biers block
- Wrist block
- Local infiltration for minor lacerations)
- General anaesthesia

The surgery

Close hand injuries are either when the skin is intact in the presence of an injury to the hand while open hand injuries are injuries with associated skin wound.

Close hand injuries

This is most commonly due to fractures, sprains, dislocations or soft tissue contusions. They are usually secondary to blunt or indirect trauma.

Treatment is by reduction and subsequent immobilization. Soft tissue contusion requires only splinting.

Open hand injuries

Most hand injuries are of this variety. They are classified into “tidy” and “untidy wounds”.

The “untidy” hand injury

The “tidy” hand injury.

1.Common causes

Mobile machinery e.g. power saws, presses, grinding machines e.t.c.

Household type accidents with blades & other cutting edges.

2.Nature

A. Surface wound

Usually multiple irregular avulsions

Usually single and clean cut.

B. Fractures

Commonly multiple & comminuted

Uncommon

C. Tendons & nerves

Gross exposure common but frequently not divided

Frequently cut.

3. Healing

Problematic

Primary healing

4. Management

A. Appraisal of damage

Often can only be determined at operation

Can usually be determined before operation

B. Use of tourniquet

Contraindicated

Not contraindicated.

C. 1⁰ operation

Reduce fractures; close all soft tissue wounds (plastic procedures frequently needed because this is usually difficult).

Repair tendons & nerves. Soft tissue wounds easily closed.

D. 2⁰ operation

Repair tendons & nerves (reconstruction procedures frequently needed)

Not generally indicated.