

# War Surgery: Weapons & Wounds - Dr. Abdulwahid

## WEAPONS

- Some wound characteristics of different weapons
- The power of a missile depends on how much kinetic energy is given up when it strikes tissue.
- The energy formula  $E = mv^2$  ( $m$ =mass,  $v$ =velocity)

## Bullets

- Small entrance wound and a large exit wound.
- Fragmentation of the bullet will cause severe wounds

## Fragments

- Caused by explosive devices, such as;
- Bombs, mortars, shells, rockets and grenades.
- The distance between the wounded person and the explosion determines the outcome.
- The blast wave from an explosion might cause rupture of the ear drums and of gas-containing viscera, such as the stomach or bowels
- Hemorrhage in the lungs, without any penetrating wound.

## Mines

- Exploding devices
- Traumatic amputation of foot or leg,
- Combined with multiple severe wounds.
- The wounds are all severely contaminated by mud, grass, pieces of shoes and clothes

## Draw Heavily On Resources:

- need a long operation time
- many operations
- blood transfusions
- dressing material
- a long hospital stay
- and a difficult period of rehabilitation, includes the fitting of an artificial limb

## Principles of management of war wounds:

- Complete wound excision
- Delayed primary closure
- No internal bone fixation
- Antibiotics
- Antitetanus

## **Record**

- Aspects of the wounds
- The treatment
- Patient's triage category.
- Whole body, including the back, must be examined.

## **Clinical examination**

- All clothing should be removed in so far as possible, bearing in mind local religious and cultural factors.
- Careful clinical examination of vascular supply to a limb, any nerve lesion.

## **Multiple wounds**

- Those on the posterior aspect of the body and limbs should be dealt with before those on
- The anterior aspect.

## **INFECTION IN WAR WOUNDS**

- War wounds are grossly contaminated with bacteria
- Inevitably become infected unless treated quickly and correctly.
- Should be treated by excision of the wound within six hours.

## **Early and thorough wound excision:**

- Reduces chances of death from gas gangrene or generalized infection;
- Reduces the number of operations
- Allows delayed primary closure to be successful.
- Shortens the stay in hospital.

## **War wounds are often multiple**

- Usually no more than 1 mm of the skin edge need be removed.

## **DRESSINGS**

Wounds should be covered by clean dressings to avoid further soiling.

### *Dressings change*

- Wounds should not have dressings changed until delayed primary closure (DPC)
- The exception to this will be when ;
  1. persisting contamination
  2. infection develop

## **Treatment of a soft tissue wound**

1. Excision of the wound
2. Delayed primary closure. Wounds should be left wide open, without any suture of skin or deep structures.

## **Excise Dead muscle**

- All dead muscle must be excised.
- Dead muscle is the ideal medium for clostridial infection leading to gas gangrene.
- The track of the missile may be surrounded by dead muscle.

## **Dead muscle**

- Not healthy
- Not contract
- Not bleed when cut
- Must be excised until: healthy, contractile, bleeding muscle is found.

## **Foreign bodies**

Remove;

- Blood clot
- Dirt
- Debris
- Missile fragments
- Clothing
- Vegetation

Gentle and copious irrigation with saline to wash out the residual debris and blood clot.

## **Fascial compartments**

- Muscle Ischemia.
- Interference With The Blood Supply
- Need Decompression By Fasciotomy

## **DO NOT**

- Open fresh planes in healthy tissue.
- Explore unnecessarily for metallic fragments; left in situ.

## **Closed primarily**

- Face, neck, scalp and genitals.
- Soft tissues of the chest wall to make an airtight closure
- Head. The dura can rarely be closed directly
- Joints. Synovial membranes should be closed
- Hand; Tendons and nerves must be covered by healthy tissue.
- Blood vessels. Those blood vessels that have been repaired should, if possible, be covered by viable muscle.

## **ANTIBIOTICS**

- Penicillin, 5 mega-units 6-hourly intravenously,
- substituted by oral penicillin, 500 mg 6-hourly 5 days

## **TETANUS**

- Clostridium tetani is the causative organism
- Produces an extremely potent toxin ; tetanospasmin which spreads by intra-axonal routes, or by bloodborne invasion.
- The toxin affects the nervous system at the motor end-plate by inhibiting the release of acetylcholine.
- typical spastic phenomena

## **All patients whatever their immunization**

- Benzylpenicillin 5 million units IV 6-hourly
- Thorough excision of the wound
- Vaccines are toxoids; they prevent disease
- Anti-toxins are used when a problem already exists

## **Immunized patients**

- Booster Dose of tetanus toxoid 0.5 ml IM

## **Non-immunized patients**

- Anti-tetanus human immunoglobulin Ig 500 I.U. IM (Adults)
- If more than 24 hours since injury;
  - Tetanus toxoid 0.5 ml I.M.
  - Tetanus toxoid 0.5 ml to be repeated at four weeks and again six months later.

## **Treatment of established tetanus**

- After the wound has been excised
- Penicillin given
- Nursed in an environment devoid of stimulation.
- Anti-tetanus human immunoglobulin (3000 – 6000 I.U. IM)
- Spasms; intermittent doses of diazepam (2-20 mg IV hourly).

## **DELAYED PRIMARY CLOSURE**

- Within seven days of injury.
- By simple approximation of the deep structures and skin, without tension.

## **The aim of DPC**

- Is to close the wound during the fibroblastic phase of wound healing (3rd and 6th days)
- Some wounds can be closed with safety earlier:
  - Wounds of the face, neck and scrotum (3rd day)
  - Upper extremity (4-5th day)
  - Lower extremities (5-7th day).

## **Tissue loss**

If there has been significant tissue loss;

- Skin grafts, or Skin
- Or Musculocutaneous Flap

## **Abdominal wounds**

- All penetrating abdominal wounds

Should be explored:

- The mortality of a negative laparotomy is low
- Whereas an un-operated abdominal wound is often fatal.

## **Prognosis of abdominal wounds**

1. The type of missile and amount of energy transferred
2. The organs hit and their number
3. The time since injury

## **SAMPLE QUESTIONS**

**Q// Write short notes on:**

- A flail segment
- compartment syndrome
- penetrating chest injuries

**Q// What is:**

- Triage?
- Fasciotomy ?

**Q// How to manage;**

- Hemorrhage and restore the volume due to bullet injury to abdomen?
- War wounds
- Tibial compound fracture
  - Pulses (absent pulses in the affected limb)
  - Pallor (loss of normal color)?