Trauma: Epidemiology Warfare Injuries Mechanism Of Injury

DEPT. OF SURGERY

INTRODUCTION

***Trauma* or injury:** damage to the body caused by an exchange with environmental energy that is beyond the body's resilience

- Injury and trauma represent a major health problem worldwide.
- Everyday around the world almost 16,000 people die from various injuries.
- 12% of the global burden of disease
- Road traffic injuries are a major cause of mortality
- 22.8% in the overall burden of death related to injuries
- Injury is the third most important cause of mortality and the main cause of death among 1 to 40-year-olds.
- Road traffic injuries represent only a fraction of the trauma spectrum

WARFARE INJURIES

War has plagued humanity since the dawn of time

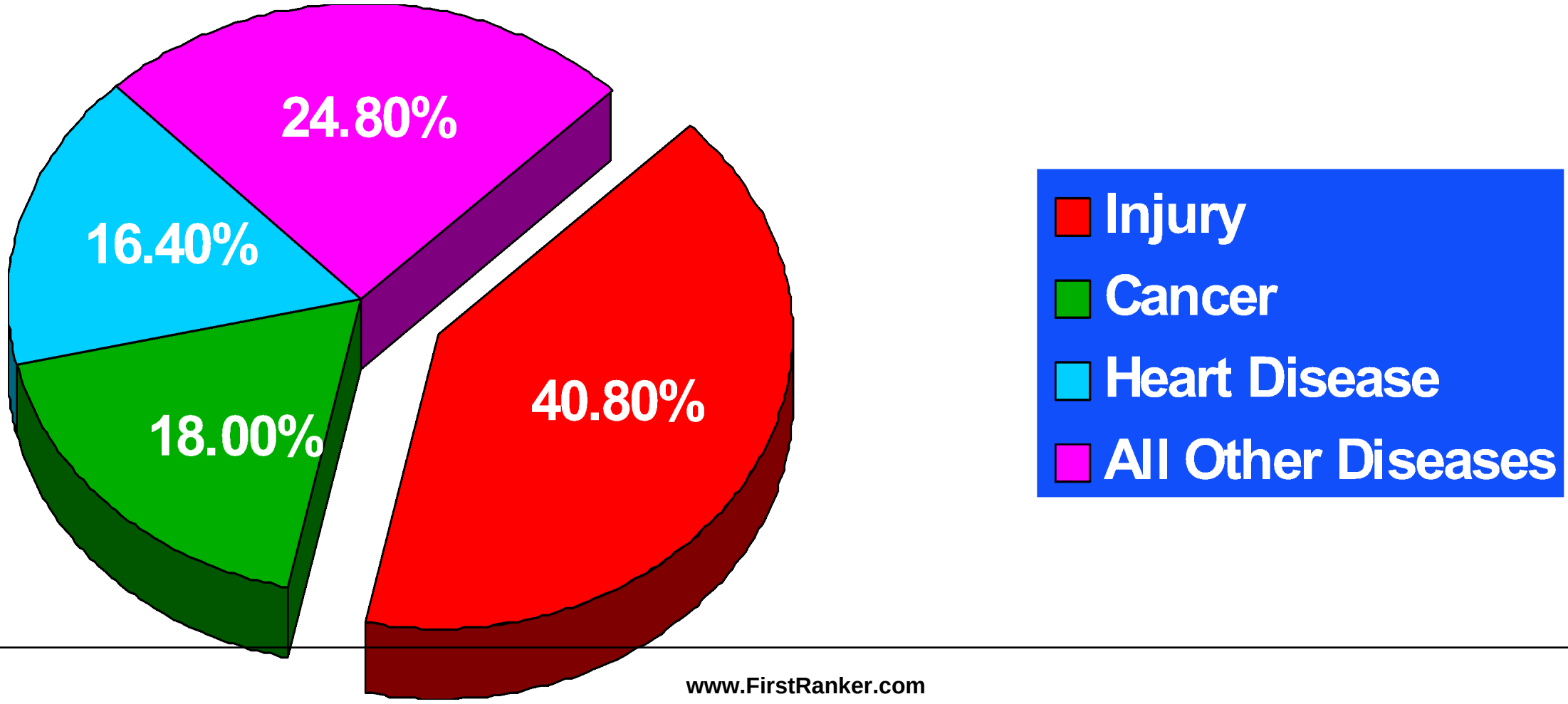
Celsus a addressed the management of battlefield casualties in the first century AD.

Introduction of gunpowder in the 14th century dramatically changed the nature of battlefield injuries.

Advances in surgical management of war wounds followed advances in weapon technology

- Musculoskeletal injuries represent approximately 70% of all war
- Ratio lower limb/upper limb is approximately 3/2, more than 50% of extremity fractures are open.
- Injuries to the head, chest, and/or abdomen have a higher mortality rate
- Bullets: main cause of penetrating injury to the limbs
- Recently replaced by fragmenting weapons such as bombs, shells, grenades, and landmines
- Blast injuries are in general dirtier than gunshot wounds and carry a higher potential for infection

Years of Potential Life Lost

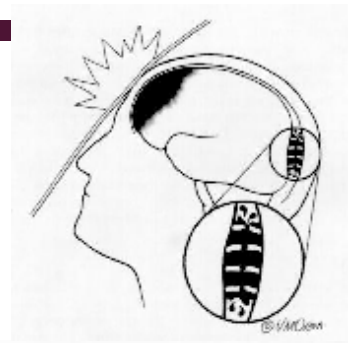


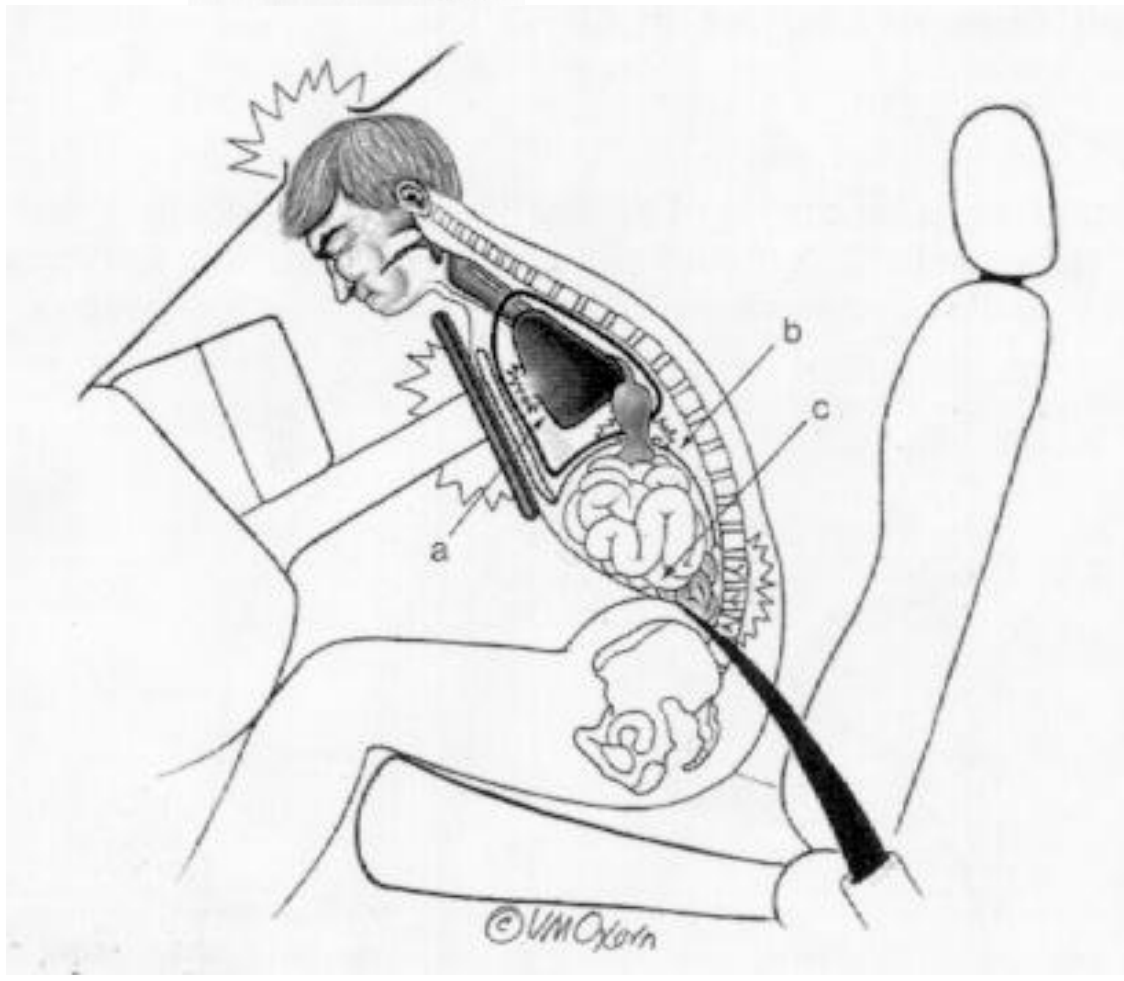
MECHANISMS OF INJURY: BLUNT TRAUMA

- Pedestrian vs Vehicle
- Falls

Mechanisms of Injury: Special Situations

- **Explosions**
  - **Blunt + penetrating + burns**
- **Burns**
- **Crush injuries**
- **Drowning**
- **Hypothermia/ exposure**





- Frontal brain contusion
- Pneumothorax
- Rupture of Left hemidiaphragm
- Small bowel rupture
- Chance fracture

- Aortic tear
  - Fixed descending aorta
  - Mobile arch
- Acute subdural brain hematoma
- Kidney avulsion
- Splenic pedicle

GUN SHOT WOUNDS: MECHANISM

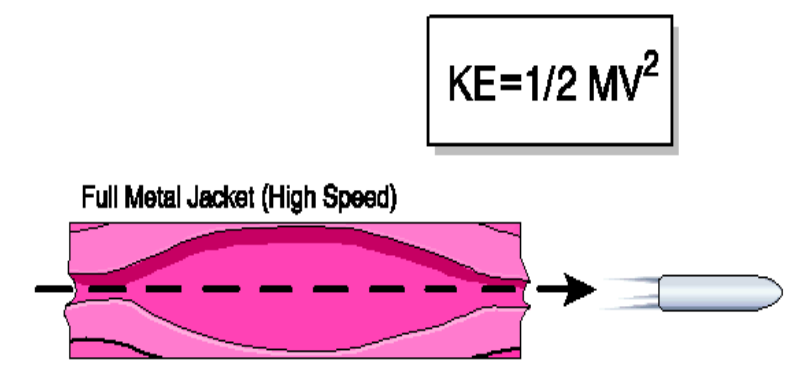
- Energy transfer
  - Shape/size of bullet
  - Distance to target
  - Velocity (most important)
    - Kinetic energy = (Mass × Velocity^2)/2
  - Surface area distributed
    - Tumble and yaw
    - Fragmentation
  - Anatomy
  - Viscoelasticity
    - Muscle
    - organs
- Mechanism
  - Blunt: Crush injury
  - Sharp:Tissue disruption
- Extent of Injury
  - Weapon size, length, sharpness, penetration
- Severe injury
  - Chest and abdomen
  - 4+ wounds

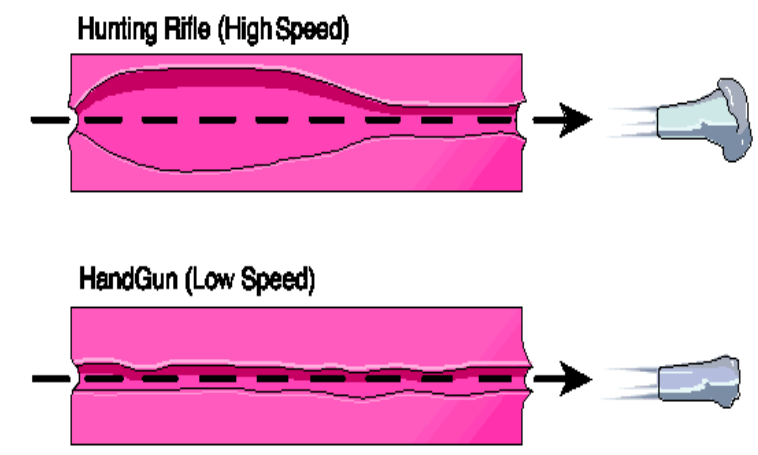
WEAPONS

- 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 = mv2**

m= mass and *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

PRINCIPLES OF MANAGEMENT OF WAR WOUNDS:

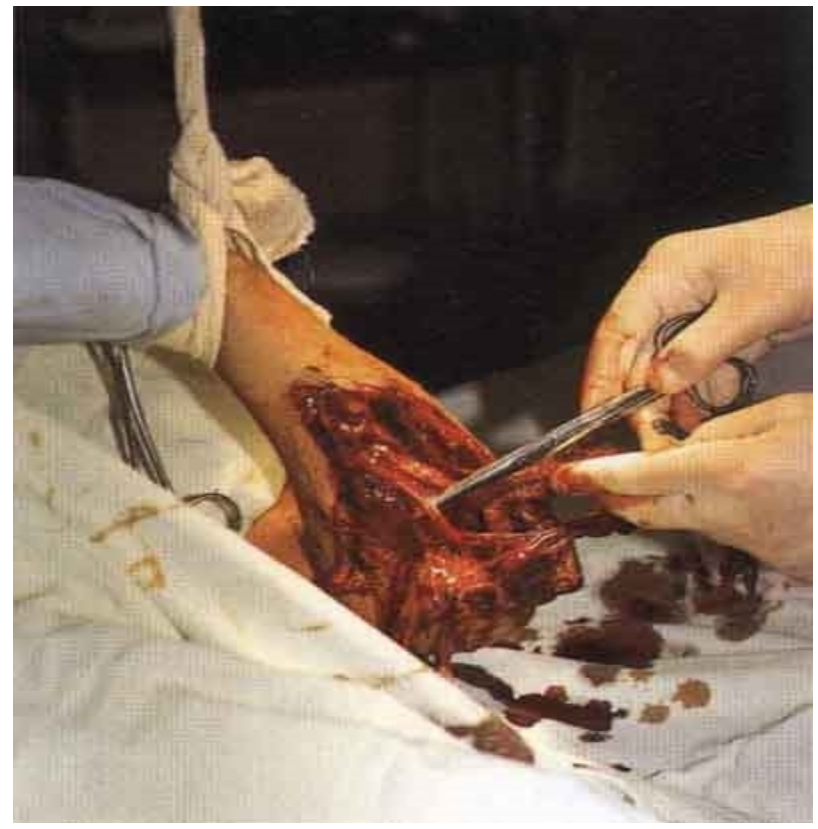
- Complete wound excision
- Delayed primary closure
- No internal bone fixation
- Antibiotics
- Antitetanus

MULTIPLE WOUNDS

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

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.



- 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.

- 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.
- Must be excised until: healthy, contractile, bleeding muscle is found.

DELAYED PRIMARY CLOSURE

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

WMDs

CBRNE

HAZMATs

PPE