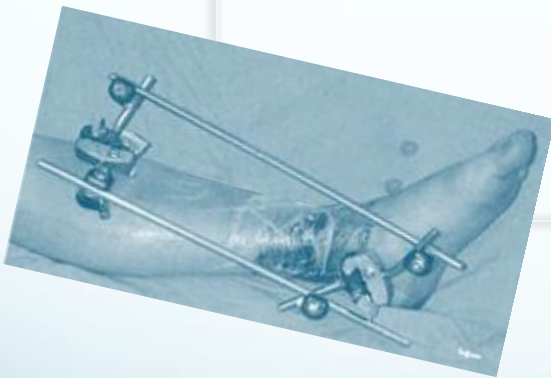
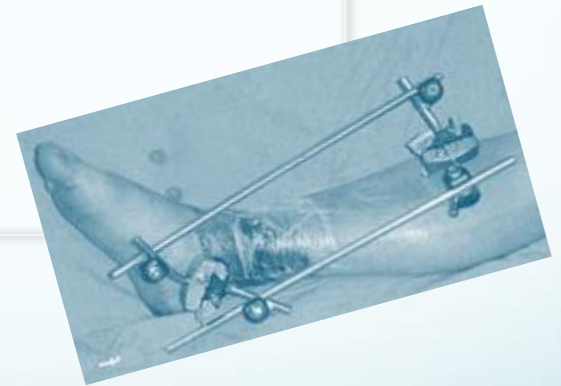


Open Fractures

Principles of Management



Prof. Mamoun Kremli



Objectives

- Definition of an open fracture
- Important points in history of an open fracture
- Classification of open fractures
- Management:
 - Initial treatment
 - Importance of surgical debridement
 - Bone treatment - initial & definitive
 - Soft tissue coverage
- Factors affecting outcome

Definition of Open Fracture

- A fracture where the skin coverage overlying the fracture is breached even if a small puncture wound
 - (Another name: Compound fracture)
 - All open fractures, no matter how trivial they seem, must be assumed to be contaminated

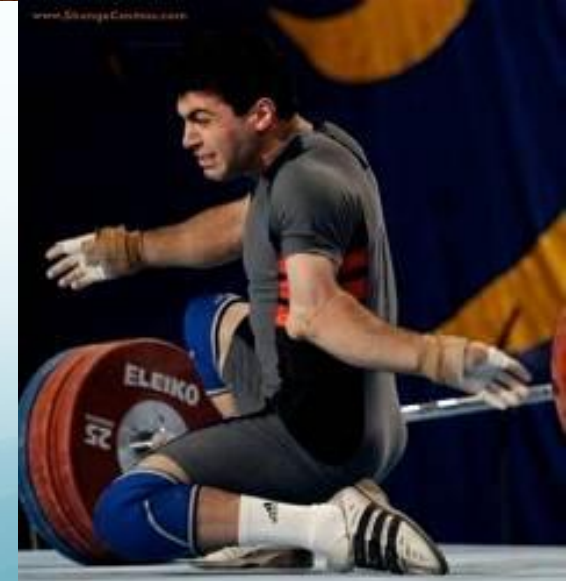


Causes (Types) of injury

- Assault & firearms: severe
- Crushing under heavy object falling. More soft tissue damage
- Fall: height is important
- Road traffic accident (RTA): severe: Car (MVA) , motorcycle, pedestrian
- Sport: stronger impact

Mechanism of Injury

- Determine if injury was caused by:
 - Crushing under objects
 - Low velocity / High velocity
- Penetrating Missiles
 - Low velocity < 300 m/s -
 - Damage along the tract
 - Commminution
 - High velocity: >300 m/s -
 - Wide soft tissue damage & sever comminution
 - Some fragment inside
 - Some flip inside
 - Vacuum phenomena - cavitation



Mechanism of Injury

- Field of injury:
 - Relatively clean
 - Contaminated soil



Mechanism of Injury

- Open injury from:
 - In-out: usually cleaner
 - Out-in: more contamination and dirt



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Signs of high energy injury

- Extensive de-gloving
- Compartment syndrome
- Crush syndrome
- Bone loss
- Segmental fracture

Examples

Low energy



High energy



Problem of open fractures

- Infection(skin is breached)
 - Primary from the field
 - Massive contamination
 - Debris and foreign bodies
 - Devitalized tissues
 - Secondary infection after internal fixation
 - Initial bacterial contamination
 - Proper debridement not done
 - Internal fixation is a foreign body

Higher infection rate

- More contamination if:
 - Delay > 12 hours
 - Exposure to fecal material
 - Exposure to oral material
 - Exposure to soil or water
 - Animal bites



History in open fractures

- Mechanism of injury
 - Date, time, type, method of impact
- Consciousness
- Size of wound
- Amount of bleeding
- Other injuries: often missed
- Anti-Tetanus status



Management of open fractures

- Initial management
- Classifying the injury
- Definitive treatment



Initial management

- It is essential that the step-by-step approach in advanced trauma life support not be forgotten
- Treat the patient, not the fracture!
 - (ABC) ATLS protocol
 - Exclude shock and brain injury
 - Vital signs
 - must be observed and followed up



Approach – clinical exam

- Examination of the viscera
 - Rib fractures: Injuries to lungs, liver, spleen
 - Pelvic fractures: Injury to urinary bladder, urethra
 - Head and spinal injury: Neurological examination
- Look:
 - Special attention is to be paid to wounds
- Feel:
 - Sensory /motor deficits
 - Pulse distal to injury
 - Tense Compartment syndrome
- Move:
 - With care, if necessary! (should splint first)

Initial management

- When the fracture is ready to be dealt with:
 - Inspect the wound
 - Remove gross contamination
 - Photograph the wound
 - Cover with a saline-soaked dressing
 - Check limb circulation & distal neurological status
 - Splint

Principles of treatment

- All open fractures, no matter how trivial they seem, must be assumed to be contaminated
- The basic guidelines:
 - Antibiotic
 - Anti-tetanus prophylaxis
 - Urgent and proper wound and fracture debridement
 - Stabilization of the fracture – ? External Fixation
 - Early definitive wound cover

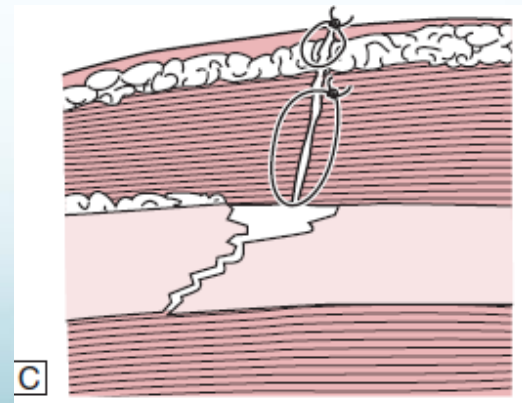
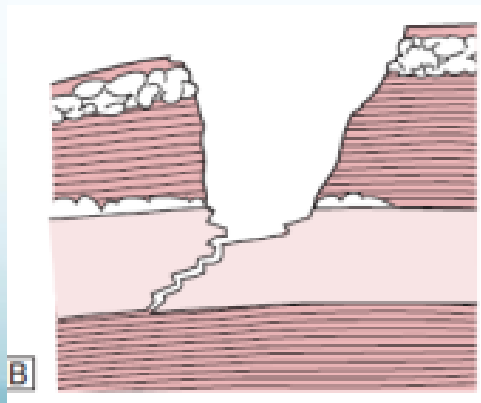
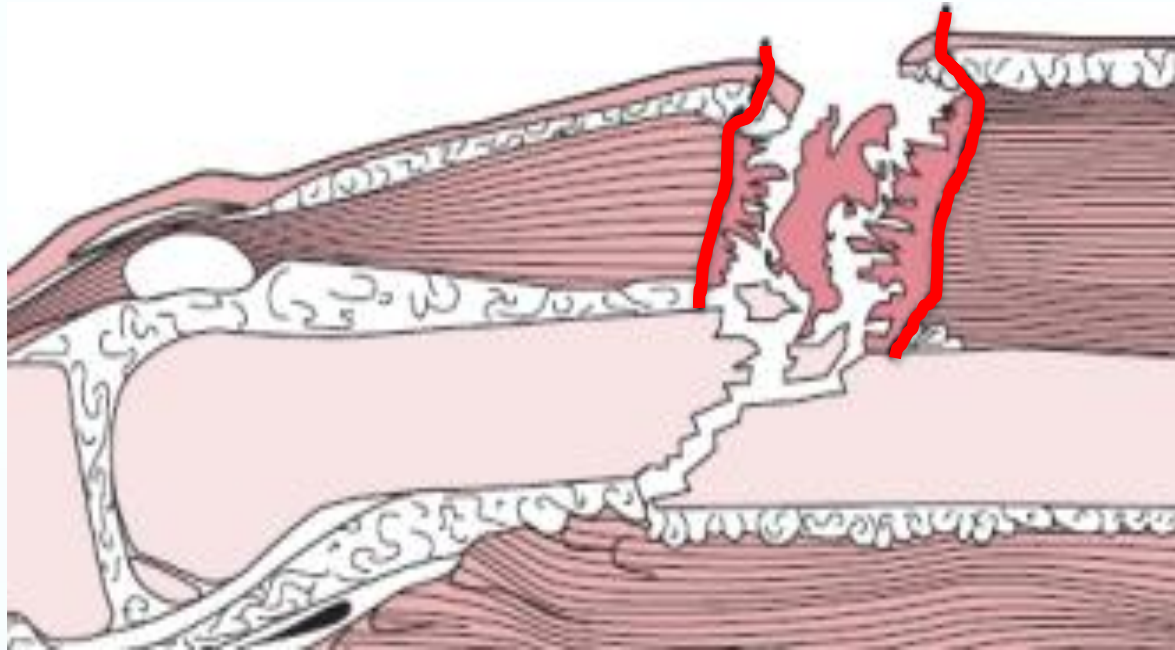


Primary Surgical Debridement

Demands meticulous excision of all dead and devitalized tissues

- Remove all foreign material
- Trim skin edges
- Remove all dead muscles & lacerated tissues & fully detached small bone pieces
- Preserve N/V !
- Saline wash: 3-6-9 Liters (wash—wash—wash)

Primary surgery - Debridement



A photograph of a surgical procedure on a patient's arm. The skin is incised, revealing underlying muscle and tissue. A surgical instrument is visible on the right side of the incision. The scene is illuminated by surgical lights, and the background is dark. A quote is overlaid on the image in white text.

“Dilution is the solution to pollution”

Alois Karlbauer

Wound closure / Bone fixation

- Bot depend on extent of soft tissue damage and contamination
 - Primary skin closure and internal fixation
 - In small wounds / good soft tissue condition / minimal contamination
 - Delayed secondary closure / External fixation
 - In larger wounds / bad soft tissue condition / more contamination

Summary

- Definition of open fracture
- Important points in history of an open fracture
- Example of types of energy in open fractures
- Management:
 - Importance of early surgical debridement
 - Soft tissue management
 - Bone treatment initial & definitive