


The background is a solid blue gradient, transitioning from a darker blue at the bottom to a lighter blue at the top. At the top, there are several thin, white, wavy lines that create a sense of movement and depth.

# General principles of fractures treatment

- 
- **Fracture** -loss of continuity of bone
  - Hairline fracture, microscopic fracture, highly comminuted fracture
  - **Dislocation** -loss of congruity between the articulation surface of joint
  - **Subluxation-articulating** surface of joint are no longer congruous but still maintain contact.

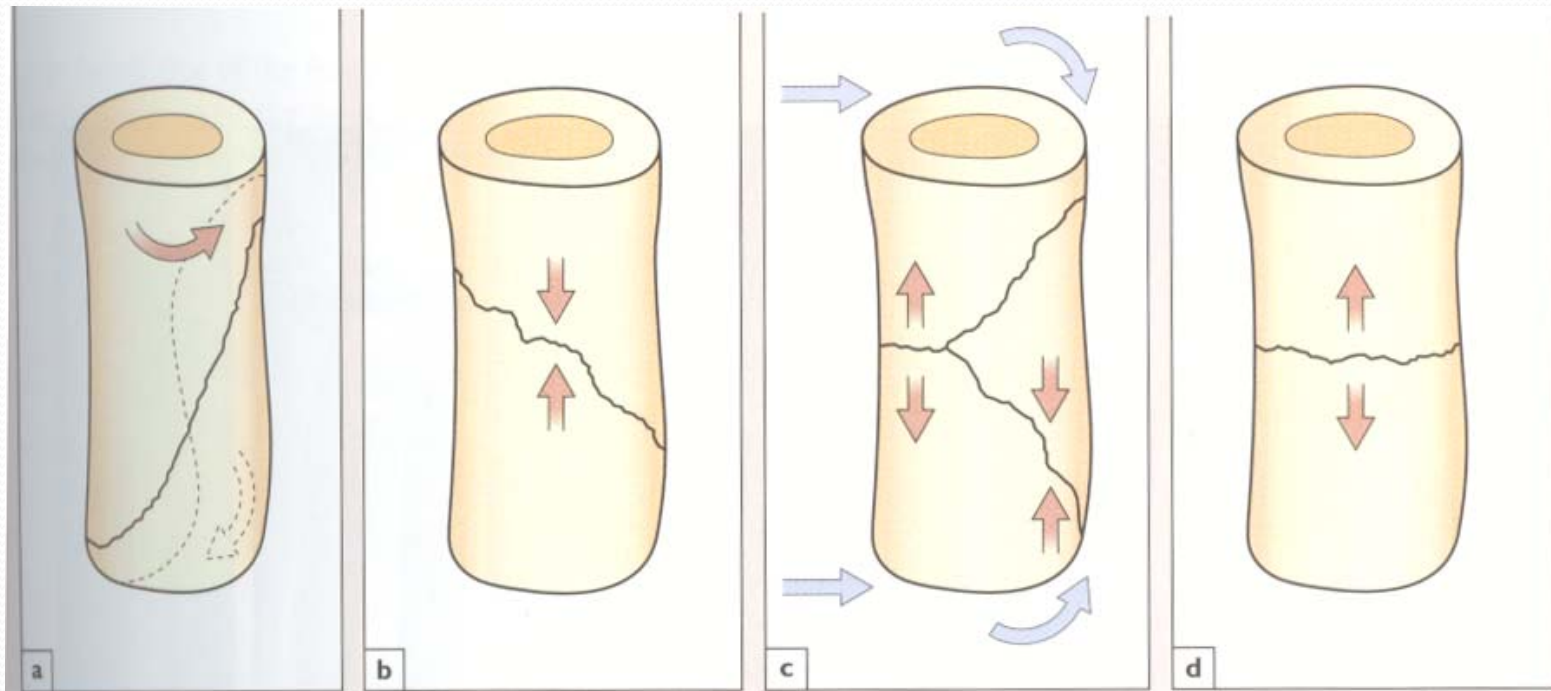
# Classification of fracture

- According plane of # surface
- Simple – closed  
Compound – open
- According to cause  
traumatic  
pathological  
stress or fatigue fracture
- According to number  
Single  
Multiple
- Complete #, incomplete#



# Mechanism of injury

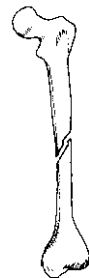
- Spiral (twisting)
- Short oblique
- Bending - Triangular 'butterfly' fragment
- Transverse



## Linear



Transverse

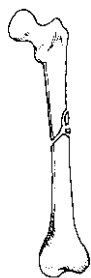


Oblique



Spiral

## Comminuted



Comminuted  $\leq 50\%$



Comminuted  $> 50\%$



Butterfly  $< 50\%$



Butterfly  $\geq 50\%$

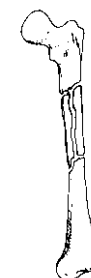
## Segmental



Two Level



Three Levels or More



Longitudinal Split

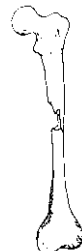


Comminuted

## Bone loss



Bone Loss  $< 50\%$



Bone Loss  $\geq 50\%$



Complete Bone Loss



# OPEN AND CLOSED FRACTURES



- Traumatic fracture

Direct violence :

Indirect violence : twisting, bending,

Muscular contraction.



# Pathological fracture

It is one in which a bone is broken through an area weakened by pre-existing disease , & by a degree of force that would have left normal bone intact  
e.g osteoporosis , O.M. , bone tumours





# Stress fracture :

**Bone, like other materials, reacts to repeated loading.  
On occasion, it becomes fatigued & a crack develops  
e.g military installations, ballet dancers & athletes.**

# How fractures happen

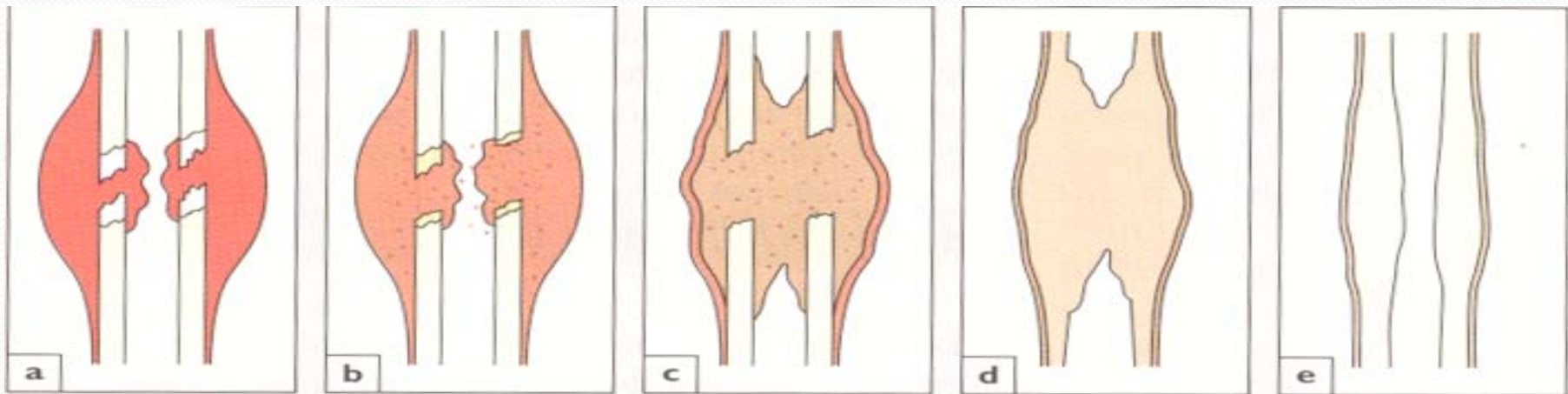
- A single traumatic incident
- Repetitive stress
- Abnormal weakening of the bone





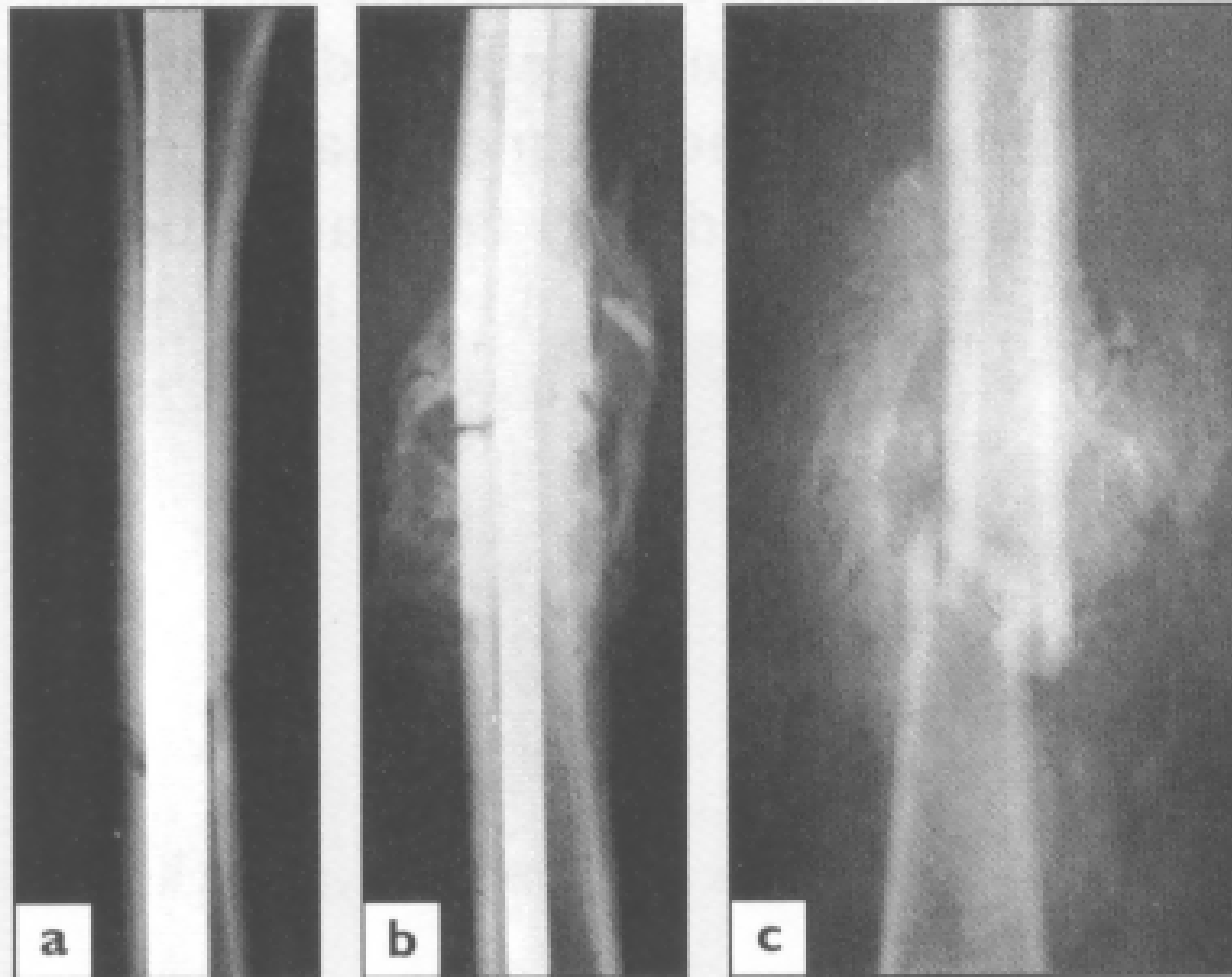
# Fractures healing

- Primary
- Secondary
- Haematoma
- Inflammation
- Callus
- Consolidation
- Remodelling





# Fractures healing



# Clinical Features of Fracture

- **History of trauma**
- **Symptoms & signs:**
  1. Pain & tenderness
  2. Swelling
  3. Deformity
  4. Crepitus
  5. Loss of function
  6. Abnormal move.
  7. N.V. injuries

# Diagnosis

- Clinical picture
- Radiography



# Principles of treatment

- Anatomical reduction
- Stable internal fixation
- Preservation of blood supply
- Early mobilization



# Implants types

- Pin and wire fixation
- Screw fixation
- Plate and screw fixation
- Intramedullary nail fixation
- External fixation

# Open fractures

- Wound debridement
- Antibiotic prophylaxis
- Stabilization of the fracture
- Early wound cover



# Principles of fractures

- ◎ Fracture repair is a **tissue regeneration** process rather than a **healing process** the injured bone is replaced by bone.
- ◎ The process of repair varies according to:
  - The type of bone involved.
  - The amount of movement at the fracture.
  - The closeness of the fracture surfaces.

# Principles of fractures

- Unfavorable factors
  - Impairment of blood supply
  - Infection
  - Excessive movement
  - Presence of tumor
  - Synovial fluid in intraarticular Fx.
  - Interposition of soft tissue
  - Any form of Nicotine

# Definitive fracture treatment

The goal of fracture treatment is to obtain union of the fracture in the most anatomical position compatible with maximal functional return of the extremity.

- Conservative
- Operative



# Principles of Treatment

- Treat the Patient, not only the fracture
- Restriction of movement
  - Prevention of displacement
  - Alleviation of pain
  - Promote soft-tissue healing
  - Try to allow free movement of the unaffected parts
- Splint the fracture, not the entire limb

# Principles of Treatment

- Methods of holding reduction:
  - Sustained traction
  - Cast splintage
  - Functional bracing
  - Internal fixation
  - External fixation

# Definitive Fracture Fixation Options

- Casts and Splints
  - Appropriate for many fractures especially hand and foot fractures
  - Adults typically will get plaster splints initially transitioned to fiberglass casts as swelling decreases
  - Kids typically will get fiberglass casts





**CLOSED, UNDISPLACED**  
**CLOSED, REDUCIBLE**  
→ **CONSERVATIVE TREATMENT**

**2- CAST**



**Below Knee**

**Above Knee**



- Complications of cast splintage

- Liable to appear once the patient has left the hospital; added risk of delay before the problem is attended to

1. Tight cast

2. Pressure sores

3. Skin abrasion or laceration

4. Loose cast





# Functional Bracing

- Prevents joint stiffness while still permitting fracture splintage and loading
- Most commonly for fractures of the femur or tibia
- Since its not very rigid, it is usually applied only when the fracture is beginning to unite
  - Comes out well on all four of the basic requirements:  
“hold” “move” “speed” “safe”





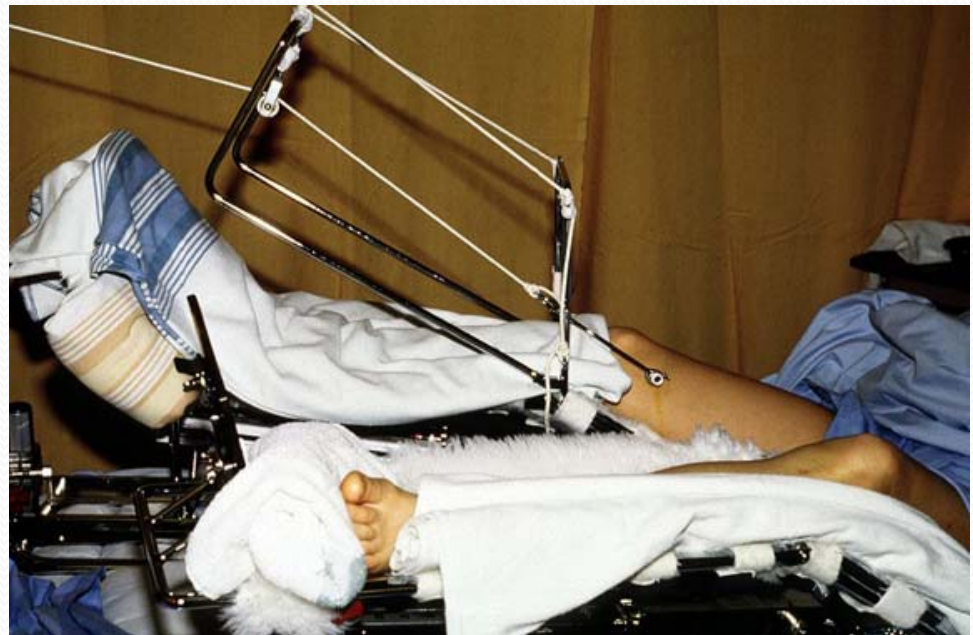
# Definitive Fracture Fixation Options

- Traction
  - Useful in patients who are too sick for surgery
  - Useful to maintain alignment until definitive fixation



- Traction by gravity
  - Eg. Fractures of the humerus
- Balanced Traction
  - Skin traction: adhesive strapping kept in place by bandages
  - Skeletal traction: stiff wire/pin inserted through the bone distal to the fracture

**Femur fracture managed with skeletal traction and use of a Steinmann pin in the distal femur.**





# Operative

- **ORIF (open reduction internal fixat.)**
- **External fixation**



# Indications of ORIF

- absolute

- relative

# Indications of ORIF

- **Absolute Indications for ORIF of fractures**
  - ⦿ Unable to obtain an adequate reduction
  - ⦿ Displaced intra-articular fractures
  - ⦿ Certain types of displaced epiphyseal fractures
  - ⦿ Major avulsion fractures where there is loss of function of a joint or muscle group
  - ⦿ Non-unions
  - ⦿ Re- implantations of limbs or extremities

# Indications of ORIF

## Relative Indications for ORIF of fractures

- ⦿ Delayed unions
- ⦿ Multiple fractures to assist in care and general management
- ⦿ Unable to maintain a reduction
- ⦿ Pathological fractures
- ⦿ To assist in nursing care
- ⦿ To reduce morbidity due to prolonged immobilisation
- ⦿ For fractures in which closed methods are known to be ineffective



# Indications of ORIF

## Questionable

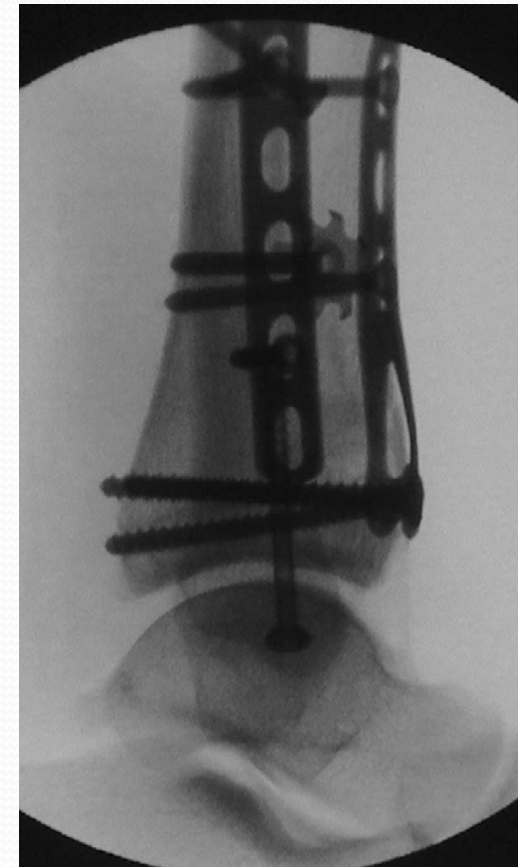
- Fractures accompanying nerve or vessel injury
- Open fractures
- Cosmetic considerations
- Economic considerations

# Types of Internal Fixation

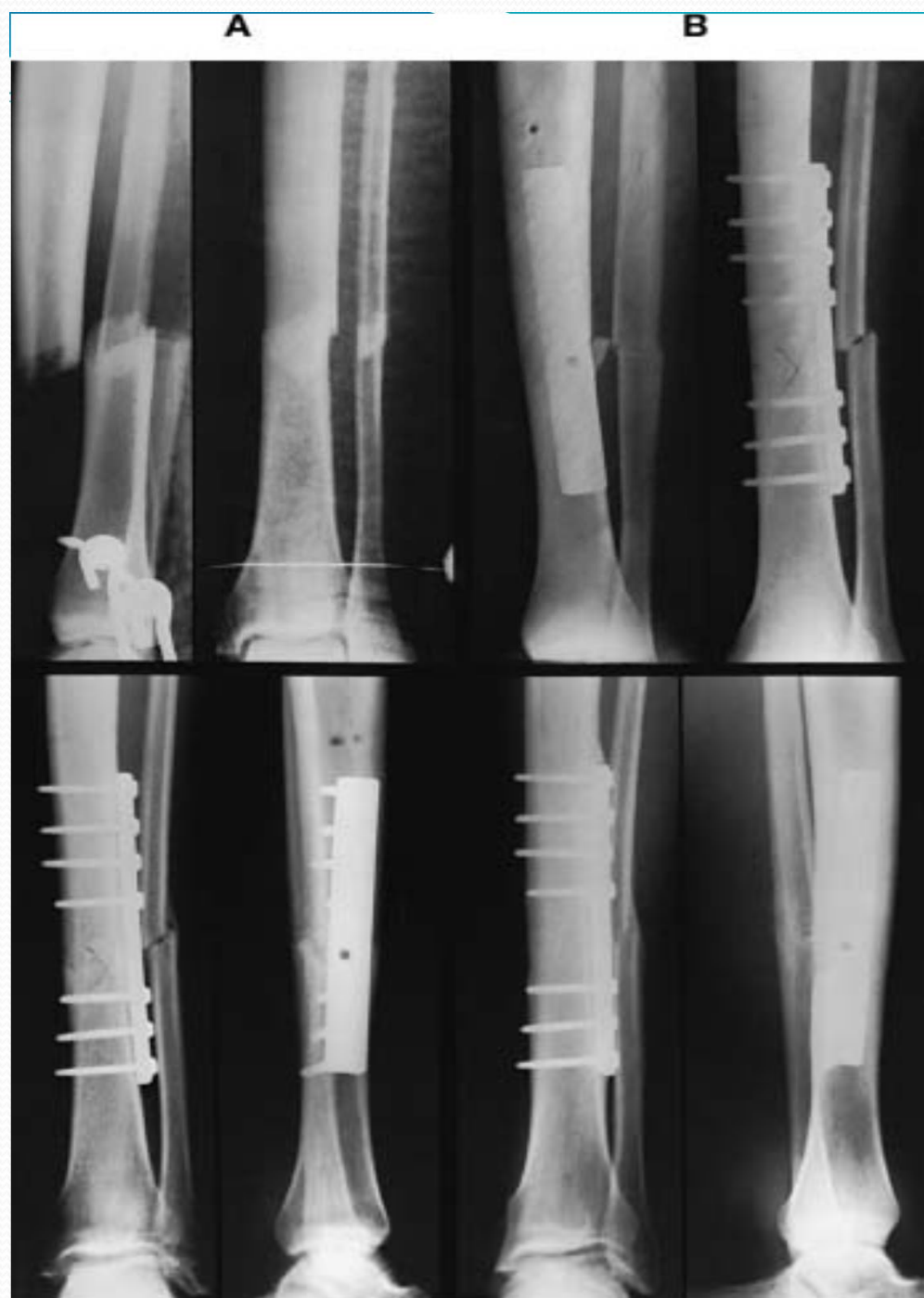
- Pin & wire fixat.
- Screw fixat.
- Plate & screws fixat.
- Intra-medullary fixat.

# Definitive Fracture Fixation Options

- Open Reduction and Internal fixation with Plates and screws
  - Used for many fractures especially those involving joints









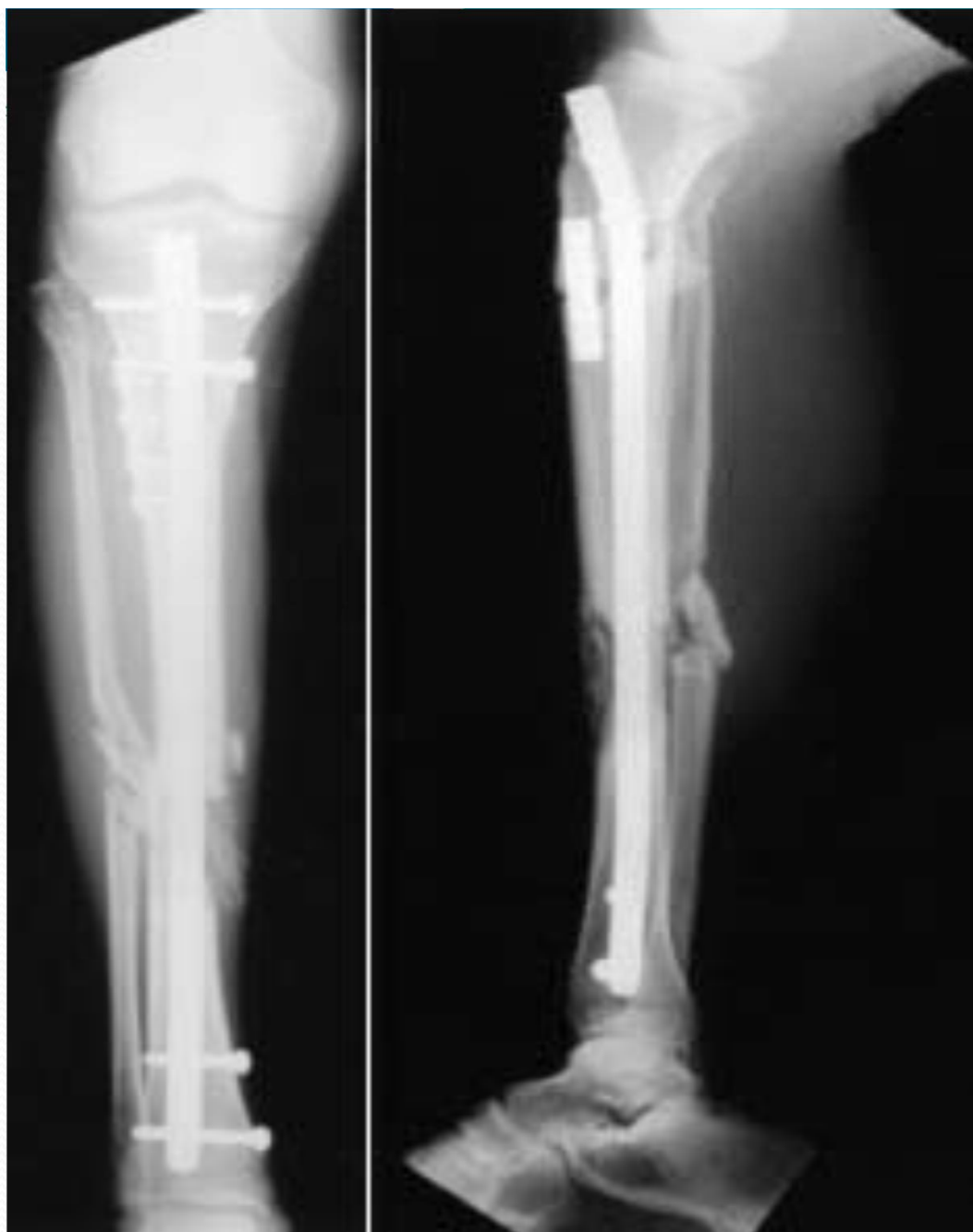
# Definitive Fracture Fixation Options

- Intramedullary Nails
  - Treatment of choice for most tibia and femur fractures
  - Used in selected humerus and forearm fractures













# Internal Fixation

- “holds” securely with precise reduction
- “movements” can begin at once (no stiffness and edema)
- “speed”: patient can leave hospital as soon as wound is healed, but full weight bearing is unsafe for some time
- “safety”= biggest problem! SEPSIS!!!
  - Risk depends on: the patient, the surgeon, the facilities

# Definitive Fracture Fixation Options

- Joint Replacement

- Used in displaced femoral neck fractures in geriatric patients
- Allows for early ambulation
- Occasionally used in geriatric pts with comminuted shoulder or elbow fractures





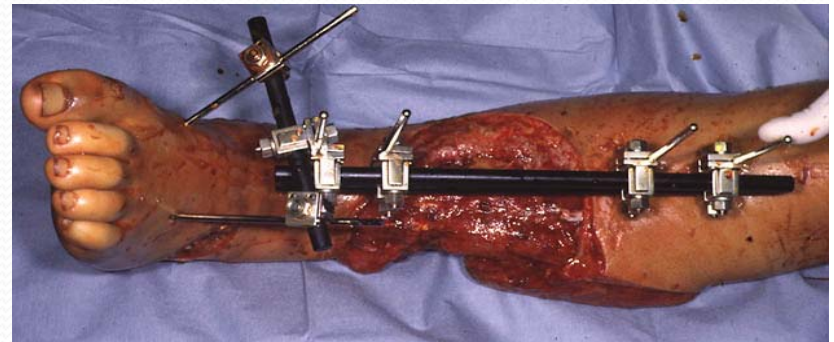
# Complications of internal fixation

- Most are due to poor technique, equipment, or operating conditions
- Infection
  - Iatrogenic infection is now the most common cause of chronic osteomyelitis
- Non-union
  - Excessive stripping of the soft tissues
  - unnecessary damage to the blood supply in the course of operative fixation
  - rigid fixation with a gap between the fragments
- Implant failure
- Refracture



# Definitive Fracture Fixation Options

- **External Fixation**
  - Used primarily in the treatment of open fractures and pelvis fractures
  - Also useful as temporary stabilization prior to definitive fixation



# External Fixation



- Permits adjustment of length and angulation
- Some allow reduction of the fracture in all 3 planes.
- Especially applicable to the long bones and the pelvis.
- Indications:
  1. Fractures of the pelvis, which often cannot be controlled quickly by any other method.
  2. Fractures associated with severe soft-tissue damage where the wound can be left open for inspection, dressing, or definitive coverage.



# External Fixation



3. Severely comminuted and unstable fractures, which can be held out to length until healing commences.
4. Fractures of the pelvis, which often cannot be controlled quickly by any other method.
5. Fractures associated with nerve or vessel damage.
6. Infected fractures, for which internal fixation might not be suitable.
7. Un-united fractures, where dead or sclerotic fragments can be excised and the remaining ends brought together in the external fixator; sometimes this is combined with elongation in the normal part of the shaft



# Complications of external fixation

- High degree of training and skill! Often used for the most difficult fractures → increased likelihood of complications
- Damage to soft-tissue structures
- Over-distraction
  - No contact between the fragments → union delayed/prevented
- Pin-track infection

# OPEN FRACTURES

- Initial Management
  - At the scene of the accident
  - In the hospital





# Types of Open Fractures

- The incidence of wound infection
  - correlates directly with the extent of soft-tissue damage,  $<2\%$  in type 1  $\rightarrow$   $>10\%$  in type 3
  - rises with increasing delay in obtaining soft tissue coverage of the fracture.



# Principles of Treatment of Open Fractures

- All open fractures assumed to be contaminated → Prevent infection!
- The essentials:
  - Prompt wound debridement
  - Antibiotic prophylaxis
  - Stabilization of the fracture
  - Early definitive wound cover
  - Repeated examination of the limb because open fractures can also be associated with compartment syndrome

# Complications of fractures

- Early
  - visceral injury
  - vascular injury
  - nerve injury
  - compartment syndrome
  - haemarthrosis
  - infection
  - gas gangrene
  - fracture blisters
  - plaster and pressure sores
- Late
  - delayed union
  - non-union
  - avascular necrosis
  - bed sores
  - myositis ossificans
  - tendon lesion
  - nerve compression
  - muscle contracture
  - joint instability
  - joint stiffness
  - algodystrophy RSD
  - osteoarthritis

Thank you