

Principles Of Fractures(2)

DrFAWZI ALJASSIR,MD, MSc, FRCSC

Associated Professor & Consultant Orthopedic Surgery

**Chairman Department of Orthopedics
Director, Orthopedic Surgery Research Chair
College of Medicine KSU & KKHU**

Chairman of Education & Training Commission of SASMA

Master In Surgical Research (McGill University).



Introduction

- Fractures in children.
- Pathological fractures.
- Management techniques.
- Open fractures.
- Complications of injury.



Fracture in children

- Different from those in adults.
- Children's bones are more malleable, allowing a plastic type of "bowing" injury.



Fracture in children

- The periosteum is thicker than in adults and usually remains intact on one side of the fracture, which helps
 1. stabilize any reduction,
 2. decreases the amount of displacement, and
 3. lower incidence of open fractures in children than in adults.



Fracture in children

- Healing is more rapid.
- Open reduction is rarely indicated.
- High remodeling rate.
- Growth disturbance.
- Often missed (poor communication).
- X-rays of both limbs for comparison.



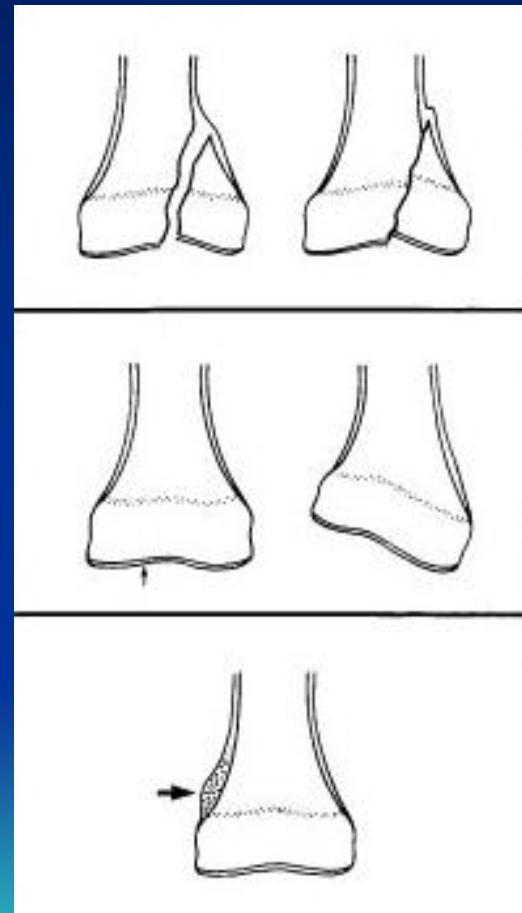
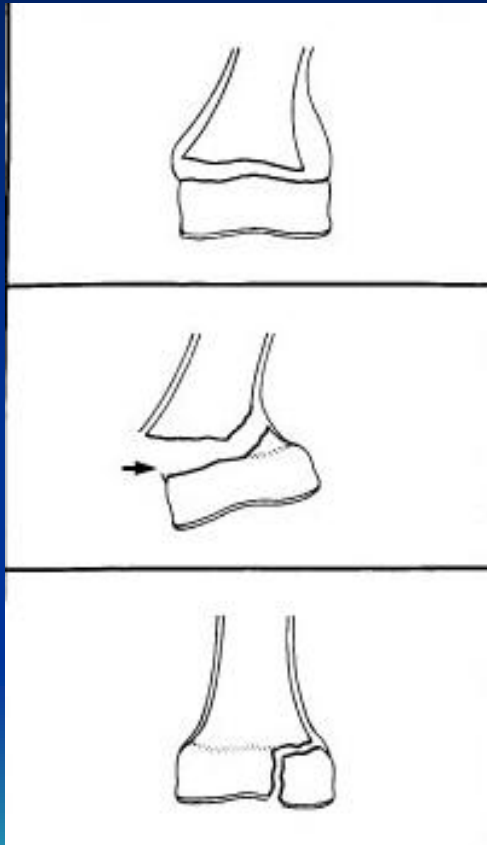
Fracture in children

Physeal Injuries

- 30% of the fractures and occurred twice as often in the upper extremities as in the lower extremities.
- commonly used classification is that of Salter and Harris, which is based on the roentgenographic appearance of the fracture



Fracture in children





Fracture in children

Birth Fractures

- *These fractures occur most commonly in the clavicle, humerus, hip, and femur.*
- *They rarely require surgery but frequently are diagnosed as pseudopalsy, infection, or dislocation.*



Fracture in children

Fractures Caused by Child Abuse

- Mostly occurs between birth and 2 years of age.
- Multiple fractures in different stages of healing are almost always indicative of child abuse.
- Multiple areas of large ecchymoses in different stages of resolution (from black and blue to brown and green) also are pathognomonic of child abuse.



Fracture in children

- The most common sites of fractures caused by child abuse are the humerus, tibia, and femur
- bone scan or a skeletal survey generally is indicated





Pathological Fractures

- Break in the continuity of bone within an abnormal bone structure.
- Abnormal bone structure could be due to:
 - 1- congenital diseases (O.I).
 - 2- Infection (osteomyelitis).
 - 3- Fracture through a cyst .
 - 4- Metabolic diseases (Osteoporosis, Osteomalacia, Pagets disease).



Pathological Fractures

5- Primary bone tumours.

6- Metastatic bone tumours.

Diagnosis:

History:

1- insignificant amount of trauma.

2- constitutional symptoms.

3- history of malignancy.



Pathological Fractures

- ***Examination :***

A / General S/S of malignancy or infection.

B / Local :

1- tenderness, pain, swelling.

2- muscle spasm and deformity is minimal.



Pathological Fractures

- ***Investigation:***

A/ Radiology:

- 1- X-rays of the lesion , MRI, CT-scan.
- 2- X-ray / CT-chest (pulmonary Mets.)
- 3- Bone Scan.

B/ Laboratory:

- 1- CBC & dif., ESR, CRP.
- 2- Acid phosphatase P, B J P,
- 3- LDH, ec..



Pathological Fractures

- Management:
- Aim: to make patient more functional and pain free for the remaining life span.
- Early operative stability should be carried out.
- Chemotherapy, Radiation, Hormonal.



Pathological Fractures

- ***Indication for prophylactic I.F (metastasis):***

1- involvement of the cortex.

2- increased pain.

3- pure lysis.

4- weight bearing area.



Management.

GENERAL AIM :

To Save the Life of Patient

LOCAL AIM : *Rapid Recovery*

- * Of Injured Part**
- * Of Its Function**



Management.

GENERAL management :

LIFE THREATENING Inj.

Shock , Head, Chest, Abdomen

LOCAL management Dangers to viability :

- * Ischaemia**
- * Infection**

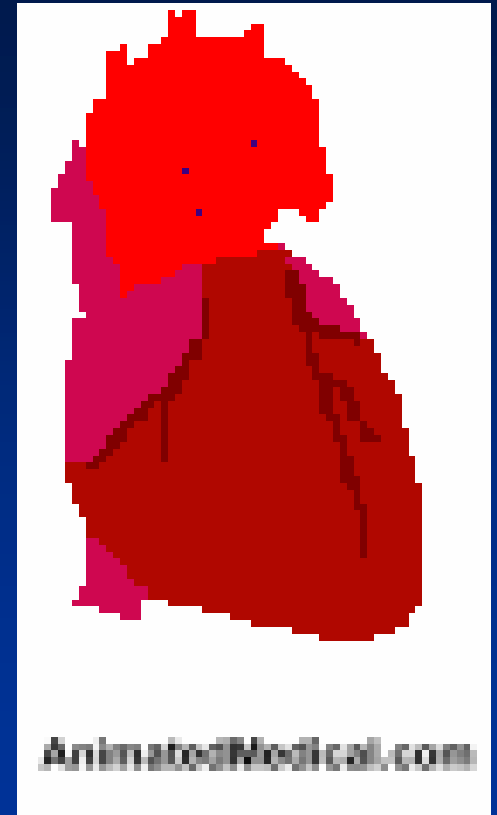


Management.

***SAVE LIFE**

***SAVE LIMB**

***SAVE FUNCTION**



Management.

SAVE FUNCTION

- 1) REDUCTION**
- 2) IMMOBILISATION**
- 3) SOFT TISSUE TREATMENT**
- 4) FUNCTIONAL ACTIVITY & REHABILITATION**



Management.

I- Reduction – Methods:

- Should be Under Anesthesia
- Closed or Open
- Study X-Ray and direction of force
- The basic Maneuvers :
 - * Traction
 - * Reverse mechanism of Inj
 - * Direct pressure



Management.

I- Reduction - Standards

- Anatomical Reduction is Ideal for all
- Anatomical Reduction is ***a MUST*** in :
 - * Dislocation
 - * Intra-articular fractures
 - * Fractures Both bones Forearm
- X-Ray Image Intensifier help control reduction
- **Remember to Assess Reduction after 10 Days !**



Management.

Reduction Standards cont...

- Reduction can be “**Acceptable**” if :-
 - * Alignment will NOT affect Function
 - * Remolding CAN correct deformity
- Remolding **can correct** :-
 - * Angular NOT Rotational deformities
 - * Children MORE than Adults



Management.

I- Reduction - Timing

- **Immediate R.** is a **MUST** in:
 - * Vascular Inj
 - * Spinal Cord or Nerve Inj
- **Urgent R.** in OPEN fractures ; “Save Limb”
- Dislocations Need **Urgent reduction** for Pain
- **CLOSED** fractures **CAN wait** If Facilities do not permit Urgent management



Management.

II- Immobilization

***“Life is Movement, and
Movement is Life”***

Do **NOT** Immobilize Any Joint Unnecessarily



Management.

II- Immobilization –Methods

- **Plaster of Paris**
- **Traction**
- **Internal Fixation**
- **External Fixator**



Open fractures.

- Fracture site communicate with the external environment.
- Emergency management.
- Infection will occur with delayed or inadequate treatment.



Open fractures.

1. General care:

- ATLS (save life, save limb, then save function).
- Antibiotics directed against staphylococci (most common), and as needed.
- Tetanus prophylaxis.



Open fractures.

- ***Local care :***

1. Clean.
2. Irrigation.
3. Debridement.
4. Decontamination of the bone.
5. Closure???
6. Immobilize.



Open fractures.

- **Always Emergency: Time is Valuable**
- **Degree depend on:-**
 - **a- Size of wound, Skin Loss**
 - **b- Amount of Soft Tissue damage especially “Muscles”,**
 - **c- Vascular status ! Arterial injury**



Classifications of Open Fractures Types:	Wound	Level of contamination	Soft tissue Injury	Bony Injury
I	< 1 cm	Clean	Minimal	Simple,minimal comminution
II	> 1cm Long	Moderate	Moderate, Some muscle damage	Moderate comminution
III A*	Usually >10 cm Long	High	Sever with crushing	Usually comminuted
B	Usually > 10 cm Long	High	Very Sever Loss of coverage	Bone Coverage is poor; Usually require soft tissue reconstructive surgery
C	Usually > 10 cm Long	High	Very sever loss of coverage + Vascular Injury requiring Repair	Bone Coverage is poor; Usually requires soft tissue reconstructive surgery

Open fractures.

- **Save Life**
- **Save Limb**
- **Save Function**



Open fractures.

- **Save Life: A B C**
- **Save Limb:**
- **Proper Local Management**
- **Antibiotics Cover: Staphylococcus (flucloxacillin, Cephalosporin)**
- **Prophylaxis: Tetanus & Gas Gangrene**
- **Save Function:**



Open fractures.

- **Save Limb & Save Function**
- **Proper Local Management:- Aim**
- **Removal of all Contaminated & devitalized Tissues**
- **Meticulous Aseptic Surgical Technique**



Open fractures.

- **Proper Local Management:- Steps**
- **1- Clean:**
 - Fracture site is covered; Sterile Gauze
 - Skin shaved, Limb Cleaned “ Betadiene”
- **2- Irrigate: Plenty of Saline or Water**
- **Dilution is the Solution For pollution**



Open fractures.

- **Proper Local Management:- Steps**
- **3- Excise Wound:-**
- **Deride = Unleash tight structures**
- **Skin: Excise edges, incise to explore!**
- **Deep Fascia: open widely, Don't Suture!**
- **Dead Muscles: Excise Liberally**



Open fractures.

- **Proper Local Management:- Steps**
- **4- Decontaminate Bone:-**
 - Curette ends, remove dirt
 - Remove small detached fragments
 - Keep large pieces
 - Reduce Fracture, Avoid Internal Fixation



Open fractures.

- **Proper Local Management:- Steps**
- **5- Close the Wound:-**
- **Primary Closure Ideal ! Skin Best Dressing**
- **Avoid Wound Tension**
- **Avoid primary suture of Nerves & tendons**
Except *Clean wounds * < 6 hours +*Expert



COMPLICATIONS

- **Boney Complications:**
- **Delayed Union:-**
 - Healing Slow but Active, Remove the cause!
 - Fracture Site Tender
 - X- Ray little Callus, Medulla Open
- **Non Union:-**
 - Reparative process Stopped, Need Intervention
 - Painless, Abnormal Movement, Pseudoarthrosis!
 - X- Ray: Sclerosis, Blocked Medulla.



COMPLICATIONS

- **Delayed Union & Nonunion Causes:-**

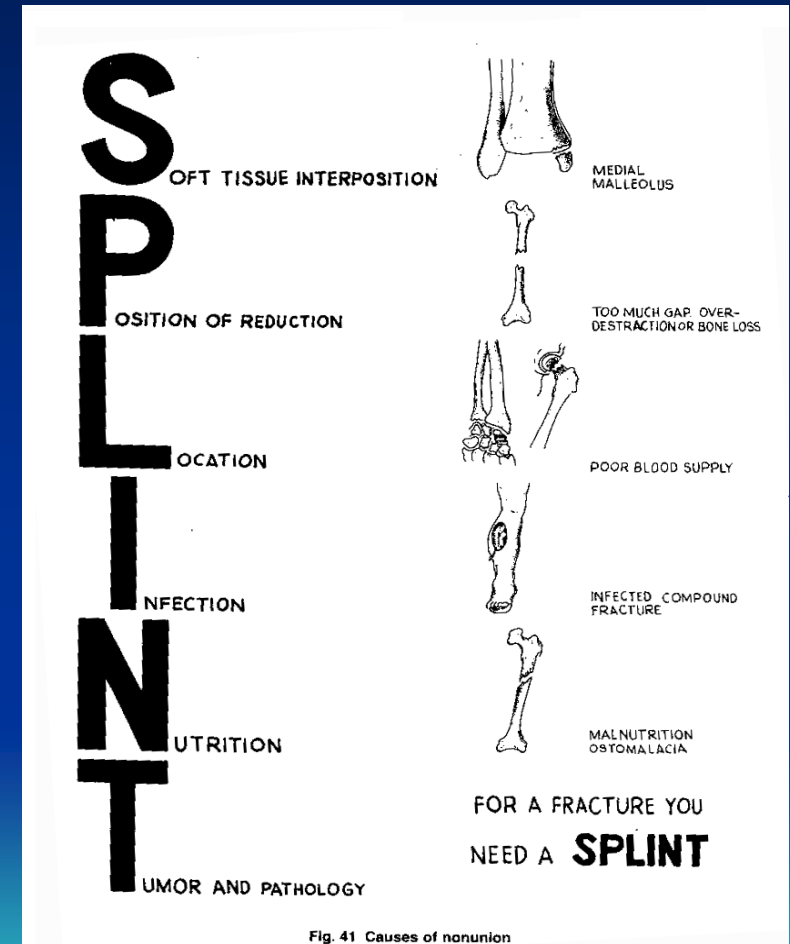
- **Local :-**

1. Poor Blood Supply
2. Soft Tissue Interposition
3. Infection
4. Inadequate Immobilization
5. Over-Distracton
6. Pathology, Tumors



COMPLICATIONS

- Delayed Union & Non Union Causes:-
- **General:-**
- Nutrition
- Bone Disease
- Old Age



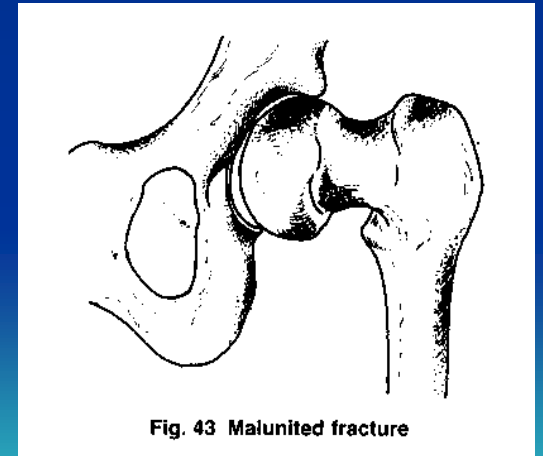
COMPLICATIONS

- **Malunion:-**

- 1- Primary Neglected #

- 2- After Reduction! Watch X-Ray After 10 Days.

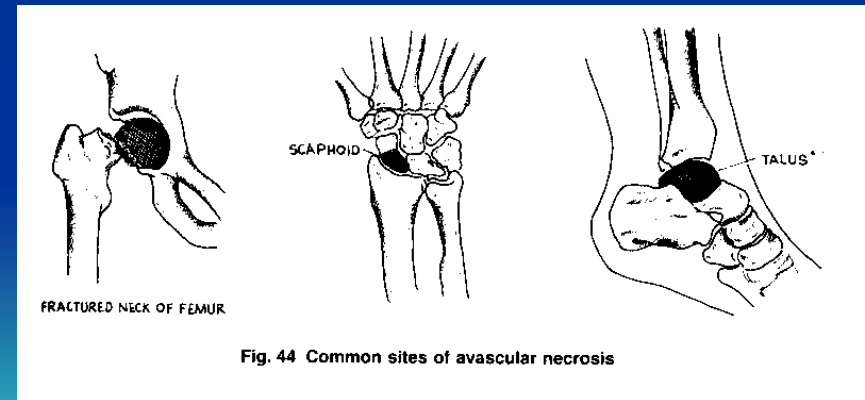
- 3- Epiphyseal Growth plate Cause Deformities...Time



Coxa Vara

COMPLICATIONS

- **Avascular Necrosis:-**
- Death of Bone from;
 - * Impairment or
 - * Loss of blood Supply
- Anatomical Sites:-----
- Sclerosis = X-Ray Dense
- Delayed or Nonunion



COMPLICATIONS

- **Myositis Ossificans:-**
“Not myo! or itis! “
- Heterotopic Ossification
- May follow minor trauma
- Susceptibility
- Elbow ; Knee; Hip

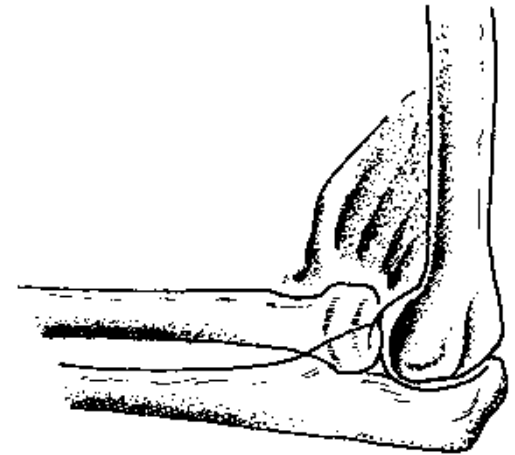


Fig. 45 Myositis ossificans of the elbow

COMPLICATIONS

Myositis Ossificans:-

- Pain & Limitation of movement
- X-Ray Calcification then Ossification
- After severe Head Injuries
- Prevention : Avoid Passive Massage
- Rest Susceptible site after injury
- May Need Excision When Mature
- There is Primary Congenital Form !
- “Myositis Ossificans Progressiva”



COMPLICATIONS

- **Reflex Sympathetic Dystrophy**
- “Sudeck’s Acute Bone Atrophy”
- Commonest Hand and foot # Arm or Leg!
- Pain, Swelling, Restriction Movement
- Skin :Glossy, Smooth, Stretched



COMPLICATIONS

- Reflex Sympathetic Dystrophy
- X-Ray: Osteoporosis
- Increased Blood Flow in the limb
- Reflex Sympathetic Activity !!
- Physiotherapy
- Sympathetic Block
 - * Medical : Drugs,
 - * Surgical: Regional Block
- Sympathectomy



COMPLICATIONS

- **Compartment Syndrome :**
elevation of the interstitial pressure in a closed osseofascial compartment that results in microvascular compromise.
- The most common causes of acute compartment syndrome are:
 - fractures,



COMPLICATIONS

- soft tissue trauma,
- arterial injury,
- limb compression during altered consciousness,
- and burns.
- Other causes include intravenous fluid extravasation and anticoagulants



