

Common Adult Fractures

Part 1: Upper Limb Fractures

Objectives of the Lecture

- know most of mechanisms of fracture injury
- make the diagnosis of common adult fractures
- request and interpret the appropriate x-rays
- initiate the proper management of fractures
- know which fractures can be treated by conservative or operative method
- Know the possible complications of different fractures and how to avoid them.

Upper Limb Fractures:

- Clavicle
- Humeral (Proximal , shaft)
- Both Bone forearm (Radius, ulna)
- Distal Radius

Mechanism of Injuries of the Upper Limb

Mostly Indirect →

Commonly described as “a fall on outstretched hand “

Type of injury depends on: 1- Position of the upper limb at the time of impact
2- Force of injury 3- Age

A- Clavicle Fractures:

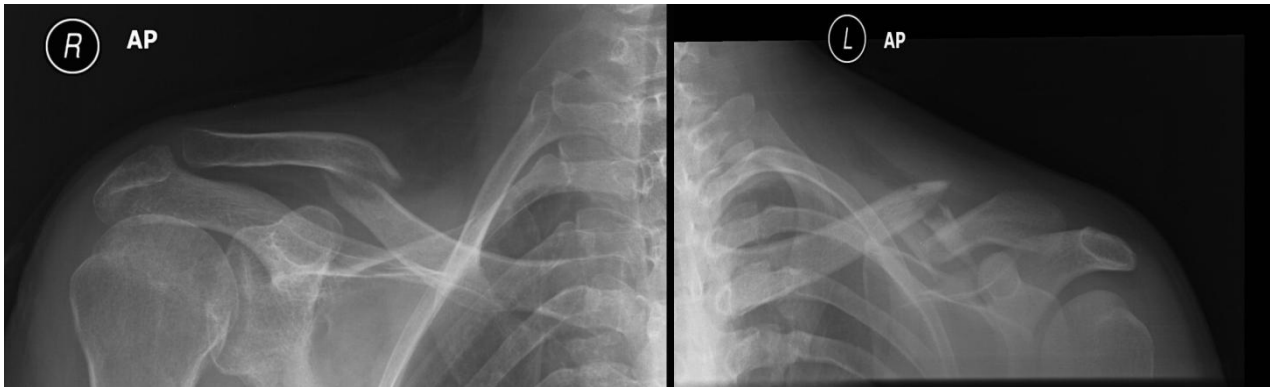
- The clavicle functions as a strut, bracing the shoulder from the trunk and allowing the shoulder to function at optimal strength
 - Incidence: 5% Proximal Third of The clavicle, 80% middle Third of The Clavicle (most common مفصلي), 15% Distal Third of the Clavicle.
 - Common In Children (Unites Rapidly without Complications in them)
- Mainly due to indirect injury
- Direct injury leads to comminuted fracture (which have Serious Complications)

Clinical Evaluation:

- Splinting of the affected extremity (to reduce the pain), with the arm adducted
- Neuro-vascular examination is necessary (due to the presence of Brachial Plexus and vessels)
- Assessment of skin integrity (open wounds)
- The chest should be auscultated

RADIOGRAPHIC EVALUATION:

- anterior-posterior radiographs
- you can see comminuted fracture



Clinical Features:

- ◆ Pain and Tenting of Skin.
- ◆ Arm is clasped to chest to splint the shoulder and prevent movement.

Treatment:

- Conservative:
 - Arm sling or figure of eight.
- Open Fixation:

Indication for It: **NO CAST** معه

N - Non Union

O - Open Fracture

C - Neurovascular Compromise Nonunion

A - Intra-articular Fracture

S - Salter- Harris 3, 4, 5 Post-traumatic arthritis at **Laterally** AC joint
 , **medially** SC joint.

T - Poly Trauma

Complications:

Neurovascular compromise (**brachial nerve injury** معه)
 Malunion

(0.1% to 13.0%, with 85% of all nonunion occurring in the middle third.)

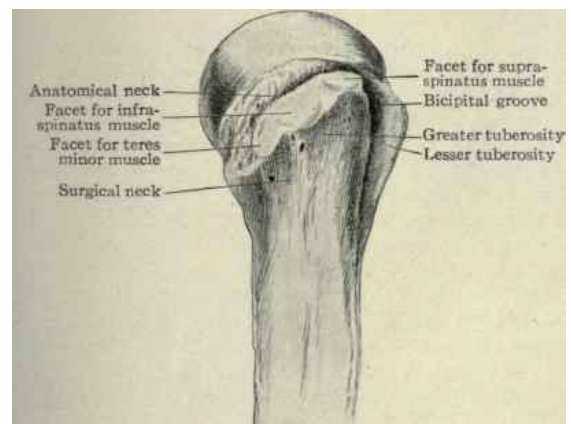
B- Humerus Fractures:

1- Proximal Humerus Fracture:

- Includes surgical and anatomical neck.
- NB : surgical neck located below the anatomical neck and it used in Orthopedics)**
- Comprise 4% to 5% of all fractures and represent the most common humerus fracture (45%).

Mechanism:

- Young: high energy Trauma
- Older: fall on an outstretched hand (FOOSH)



Clinical Evaluation:

- Pain, swelling, tenderness, painful range of motion, and variable crepitus. Ecchymosis
- A careful neuro-vascular examination is essential, axillary nerve function.

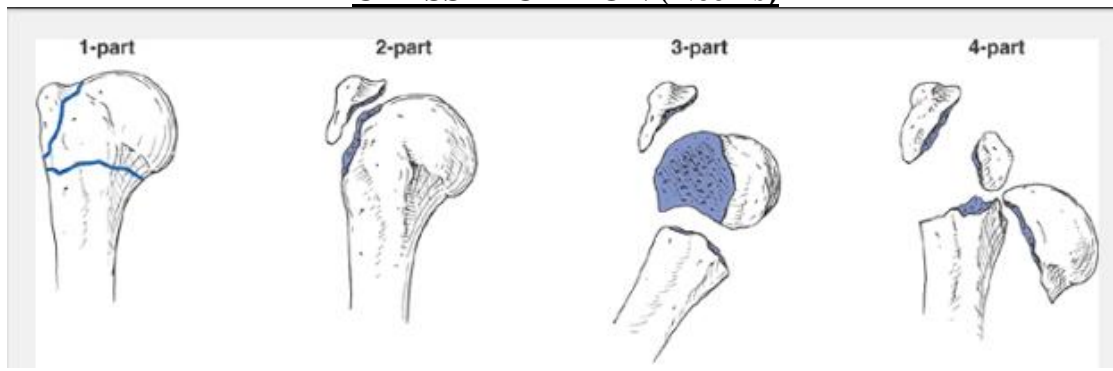
Motor: movement of the Deltoid muscle

Sensory: to deltoid Muscle

RADIOGRAPHIC EVALUATION:

- AP and lateral views
- Computed tomography: To evaluate for articular involvements and Fracture Displacement.
- Magnetic resonance imaging

CLASSIFICATION (Neer's)



- ♦ **Neer classification** is based on 4 fractures fragments: Humeral Head, Greater Tuberosity, Lesser Tuberosity, and Humeral Shaft.

1- Non-displaced: Displacement is $< 1\text{cm}$ and/or angulation < 45 degree.

2- Displaced: Displacement is $> 1\text{cm}$ and /or angulation > 45 degree.

3- Dislocate/ Subluxed: Humeral head dislocated. subluxed from glenoid.

So,

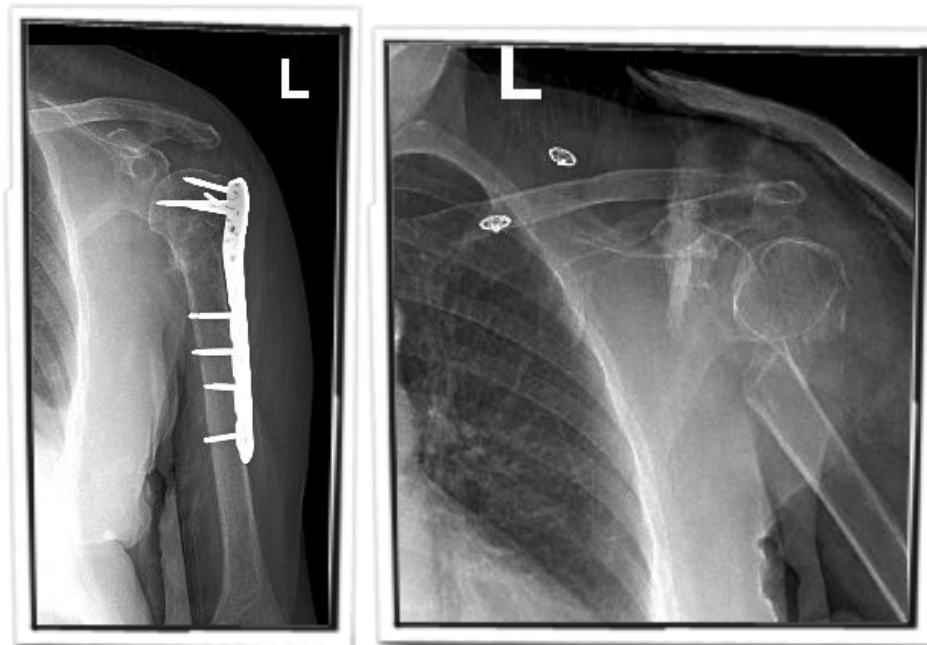
- **Two-part Fracture:** Any of the 4 parts with 1 displaced
- **Three part Fracture:** Displaced fracture of the surgical Neck + displaced greater tuberosity or lesser tuberosity.
- **Four- part Fracture:** Displaced fracture of Surgical Neck + both Tuberosities.

TREATMENT: 1- conservative for :

- Minimally displaced fractures:
 - 85% of proximal humerus fractures are minimally displaced or nondisplaced.
 - Sling immobilization for comfort.
 - Early shoulder motion may be instituted at 7 to 10 days.
 - Pendulum exercises and passive range-of-motion exercises.
 - At 6 weeks, active range-of-motion exercises are started.

Group A1

- 2- Surgical indication:
 - Anatomic neck fracture.
 - Surgical neck fracture.
 - Greater tuberosity fractures: If they are displaced more than 5 to 10 mm.
 - Lesser tuberosity fractures displaced fragment blocks internal rotation or associated posterior dislocation.
 - Three- part fractures
 - Four- part fractures Associated almost with A-Vascular Necrosis (AVN)
 - Incidence of osteonecrosis ranges from 13% to 35%.
 - ORIF may be attempted in young patients if the humeral head is located within the glenoid fossa
 - Primary prosthetic replacement of the humeral head (hemiarthroplasty)) is the procedure of choice in the elderly
 - Fracture-dislocation

ORIF- surgical neck fractureORIF surgical Neck**COMPLICATIONS**

- Vascular injury: (5% to 6%); the axillary artery is the most common site
- Neural injury
 - Brachial plexus injury: (6%).
 - Axillary nerve injury
- Chest injury: Intrathoracic dislocation; pneumothorax and hemothorax
- Myositis ossificans
- Shoulder stiffness
- Osteonecrosis: 3% to 14% of three-part proximal humeral fractures, 13% to 34% of four-part fractures, and a high rate of anatomic neck fractures.
- Nonunion
- Malunion

2- Shaft of the Humerus Fracture:

- Commonly Indirect injury
- 3% to 5% of all fractures
- Indirect injury results in Spiral or Oblique fractures
- Direct injuries results in transverse or comminuted fracture
- May be associated with Radial Nerve injury (AT THE SPIRAL GROOVE OF THE HUMERUS) مهم

Clinical Evaluation:

- Typically present with pain, swelling, deformity, and shortening of the affected arm, crepitus.
- Soft tissue abrasions and minor lacerations must be differentiated from open fractures
- careful neurovascular examination is essential, with particular attention to radial nerve function

RADIOGRAPHIC EVALUATION:

AP and lateral radiographs of the humerus should be obtained, including the shoulder and elbow joints on each view.

CLASSIFICATION (Descriptive):

- Open vs. closed.
- Location: proximal third, middle third, distal third.
- Degree: nondisplaced, displaced.
- Direction and character: transverse, oblique, spiral, segmental, comminuted
- Articular extension.

Management of Fracture Shaft of the Humerus:

- Most of the time is Conservative
 - (>90%) will heal with nonsurgical management
 - 20 degrees anterior angulation, 30 degrees of varusangulation and up to 3 cm of bayonet apposition are acceptable and will not compromise function or appearance
- Closed Reduction in upright position followed by application of U shaped Slab of POP or Cylinder cast.
- Few weeks later or initially in stable fractures Functional Brace may be used
- Hanging cast: This utilizes dependency traction by the weight of the cast and arm to effect fracture reduction:
 - It is frequently exchanged for functional bracing 1 to 2 weeks after injury.
 - More than 95% union is reported

Indications for ORIF Fracture Shaft of Humerus

- i. Multiple trauma
- ii. Inadequate closed reduction or unacceptable malunion
- iii. Pathologic fracture
- iv. Associated vascular injury
- v. Floating elbow
- vi. Segmental fracture
- vii. Intraarticular extension
- viii. Bilateral humeral fractures
- ix. Open fracture
- x. Neurologic loss following penetrating trauma → to explore the nerve مهمه
- xi. Radial nerve palsy after fracture manipulation (controversial)
- xii. Nonunion

Surgical Techniques:

- ❖ Open reduction and internal fixation using plate and screws
 - ❖ Intramedullary nail or K-wires
 - ❖ External fixator: Indications include:
 - Infected nonunions.
 - Burn patients with fractures.
 - Open fractures with extensive soft tissue loss.
- Complications include pin tract infection, neurovascular injury, and nonunion.

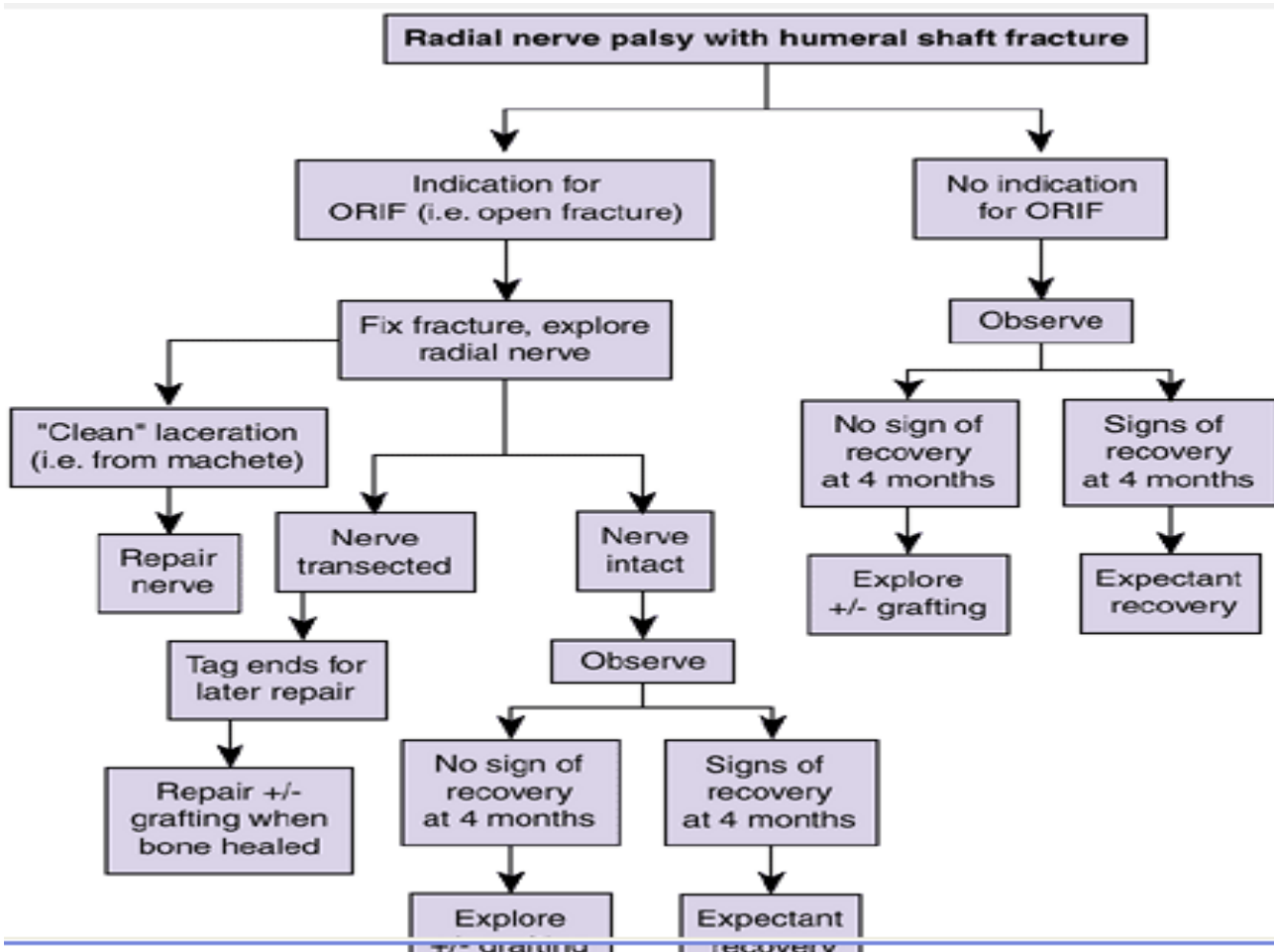
**COMPLICATIONS**• **Radial Nerve Injury (Wrist drop):**

Fracture humerus in up to 12% of fractures

- a. 2/3 (8%) of Radial injury are Neuropraxia (no actual damage and it will heal with time .
- b. 1/3 (4%) are nerve lacerations or transection.

Management of Radial Nerve injury

- Open fractures ; immediate exploration and ± repair
- In closed injuries treated conservatively; initial management is doing Nerve Conduction Studies (NCS) and Electromyography (EMG) after 6 weeks, and awaiting for spontaneous recovery
- Recovery usually starts after few days but may take up to 9 months for full recovery
- If No spontaneous recovery occurs in 12 weeks confirmed by NCS and EMG ;then exploration of the nerve should be carried out

**Vascular injury:**

It is uncommon

The brachial artery has the greatest risk for injury in the proximal and distal third of arm.

It constitutes an orthopedics emergency; arteriography is controversial because may prolong time to definitive treatment for an ischemic limb

Nonunion:

Up to 15%

Risk factors: at the proximal or distal third of the humerus, transverse fracture pattern, fracture distraction, soft tissue interposition, and inadequate immobilization

ORIF+Bone graft

c- Both Bone forearm (Radius, ulna):

- Forearm fractures are more common in men than women.
- Motor vehicle accidents, contact athletic participation, altercations, and falls from a height.

Clinical Evaluation:

- Gross deformity of the involved forearm, pain, swelling, and loss of hand and forearm function.
- A careful neurovascular
- open wound
- compartment syndrome مهمه جدا جدا - مكان شائع لها - سؤال

Radiographic Evaluation:

Anteroposterior (AP) and lateral views

Radiographic evaluation should include the two joints.



Classification (Descriptive):

- Closed versus open
- Location
- Comminuted, segmental, multifragmented
- Displacement
- Angulation
- Rotational alignment

Treatment: → MAINLY SURGICAL (MCQ)

- ♦ Nonoperative
 - Nondisplaced fracture need a well-molded, long arm cast in neutral rotation with the elbow flexed to 90 degrees.
 - Follow-up to evaluate for possible loss of fracture reduction.

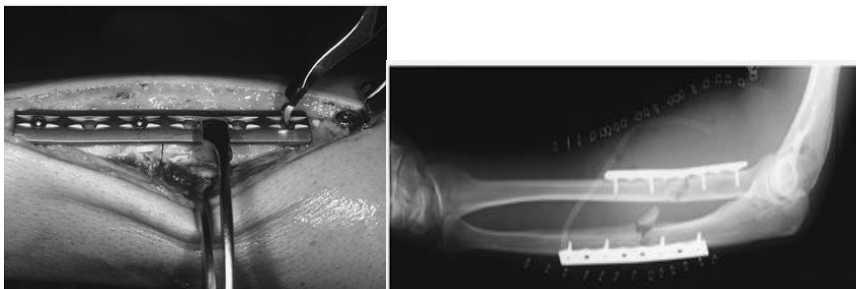
1- Operation:

A. Open reduction and internal fixation

B. External fixation

Indication

- severe bone
- soft tissue loss
- gross contamination
- infected nonunion
- Open elbow fracture-dislocations with soft tissue loss.



Complications:

A. Nonunion and malunion

b. Infection:

c. Neurovascular injury

d. Volkmann ischemia follows Compartment Syndrome. → MCQ

e. Posttraumatic radioulnar synostosis (3% to 9%) → (formation of new bone prevent supination and pronation) → this complication is specific for this fracture مهمه

D- Distal Radius Fracture:

- Distal radius fractures are among the most common fractures of the upper extremity.
- one-sixth of all fractures treated in emergency departments

CLINICAL EVALUATION:

◆ Wrist deformity and displacement of the hand in relation to the wrist (dorsal in Colles or dorsal Barton fractures and volar in Smith-type fractures). The wrist is typically swollen with ecchymosis, tenderness, and painful range of motion.

◆ Neurovascular assessment:

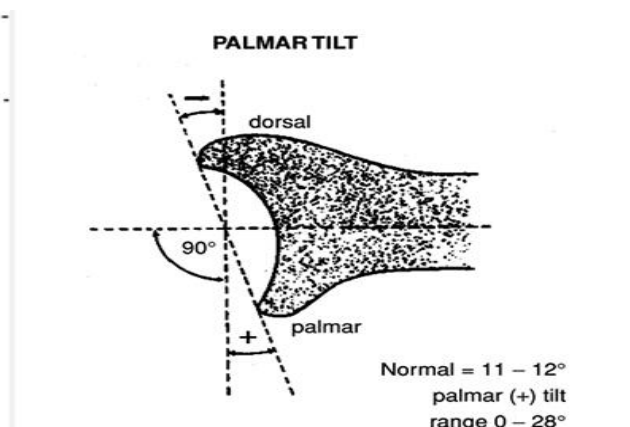
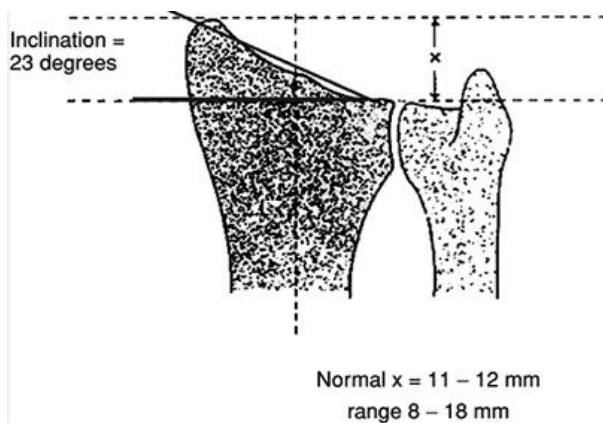
Median nerve function. Carpal tunnel compression symptoms are common (13% to 23%). → specific for this fracture (MCQ)

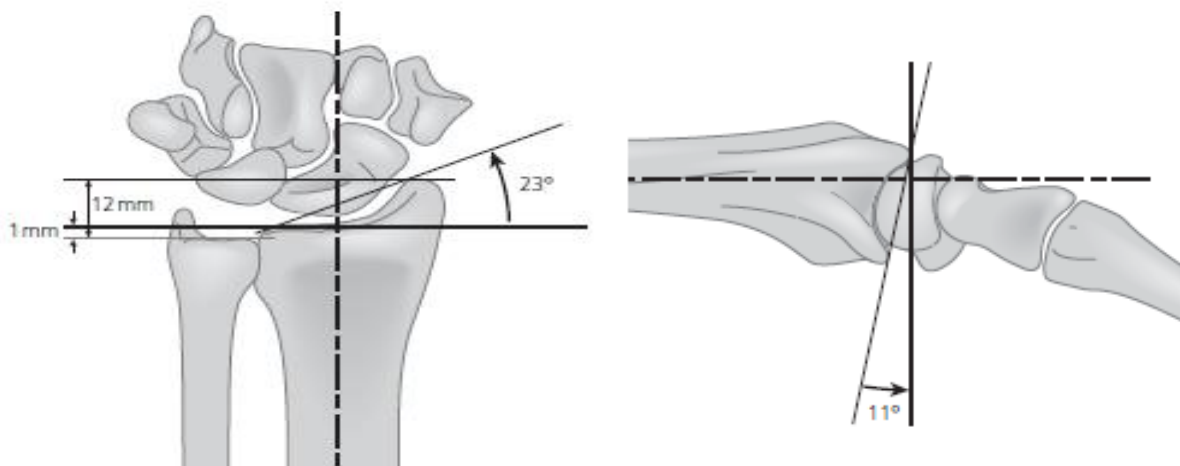
RADIOGRAPHIC EVALUATION:

Posteroanterior and lateral views

Normal radiographic relationships

- Radial inclination: averages 23 degrees (range, 13 to 30 degrees) مهم
- Radial length: averages 11 mm (range, 8 to 18 mm). (مهم – اضربها ب 2 لتحصل على a)
- Palmar (volar) tilt: averages 11 to 12 degrees (range 0 to 28 degrees).



Group A1

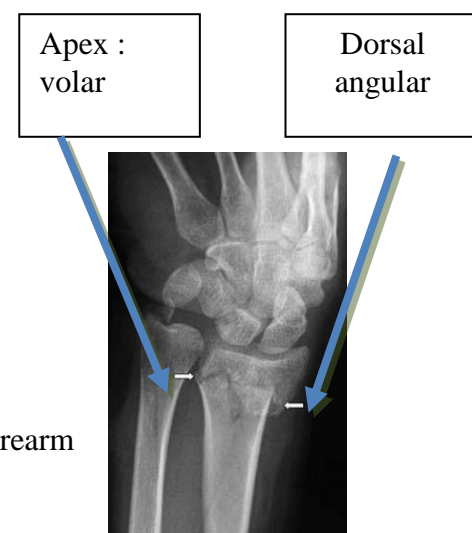
Radiological Evaluations

**CLASSIFICATION (Descriptive):**

- Open versus closed
- Displacement
- Angulation
- Comminution
- Loss of radial length

Colles' fracture:

- Extraarticular fractures.
- 90% of distal radius fractures
- Dorsal angulation (apex volar), dorsal displacement, radial shift, and radial shortening.
- Clinically .dinner forka deformity.
- Mechanism: a fall onto a hyperextended, radially deviated wrist with the forearm in pronation.
- Usually don't Need operative Treatment
- NB : it has dorsal angulations (apex volar)



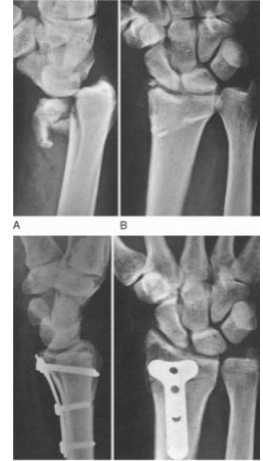
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Barton fracture:

• A fracture-dislocation or subluxation of the wrist in which the dorsal or volar rim of the distal radius is displaced with the hand and carpus. Volar involvement is more common --ORIF

• Mechanism: a fall onto a dorsiflexed wrist with the forearm fixed in pronation

• Usually needs operative Treatment. MCQ

**Smith fracture (reverse Colles fracture):**

• A volar angulation (apex dorsal) of the distal radius with an garden spades deformity or volar displacement of the hand and distal radius ----ORIF

• Mechanism: a fall onto a flexed wrist with the forearm fixed in supination

TREATMENT

• Acceptable radiographic parameters for a healed radius in an active, healthy patient include: (indications for conservative treatment) :

- Radial length: within 2 to 3 mm of the contralateral wrist.
- Palmar tilt: neutral tilt (0 degrees).
- Intraarticular step-off: <2 mm.
- Radial inclination: <5-degree loss.

Nonoperative: CR + casting, Hematoma block, Bier block, or conscious sedation

Operative: indications

- High-energy injury
- Secondary loss of reduction
- Articular comminution, step-off اختلاف المستوى, or gap
- Metaphyseal comminution or bone loss
- Loss of volar buttress with displacement
- DRUJ incongruity

Operative Techniques

•Percutaneous pinning .



ORIF .



External fixation

COMPLICATIONS

- Median nerve dysfunction
- Malunion or nonunion
- Complications of external fixation include reflex sympathetic dystrophy, pin tract infection, wrist and finger stiffness, fracture through a pin site, and radial sensory neuritis
- Tendon rupture, most commonly extensor pollicislongus — مهمه MCQ
- Midcarpal instability
- Posttraumatic osteoarthritis
- Finger, wrist, and elbow stiffness

Done 1/2!

Part 2: Lower Limb Fractures

In General:

Mechanism of fractures

- Lower limb fracture is a result of a high energy trauma like MVA, fall, except in elderly people or diseased bones.
- Types of fracture are depend on position of limb during impaction and magnitude of forces applied.

Management

- The proper way to treat a patient with high energy trauma is to look at the patient as whole, not to injured limb alone!
- So the aim to treat such patient is to save life first, then save limb, finally to save function.
- A.B.C.D

1- Pelvic fractures: --> usually life threatening fractures because they can cause sever hemorrhage → in this type ALWAYS rule out open fractures

- Classifications. (Tile)

Type A. Stable

Type B. Rotationally Unstable, Vertically Stable.

Type C. Rotationally and Vertically Unstable.

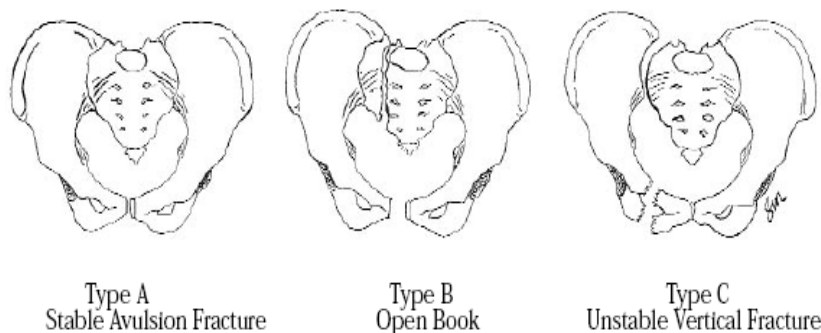


Figure 20. Illustration of the Tile Classification of Pelvis Fractures

So, Type A

Type A stable Fracture of superior & inferior pubic remi& no diasthesis of SP (SymphysisPubis)



Type B

Type B open book fracture Diasthesis (**force causing separation**) of SP more than 2cm



Group A1**Type C**

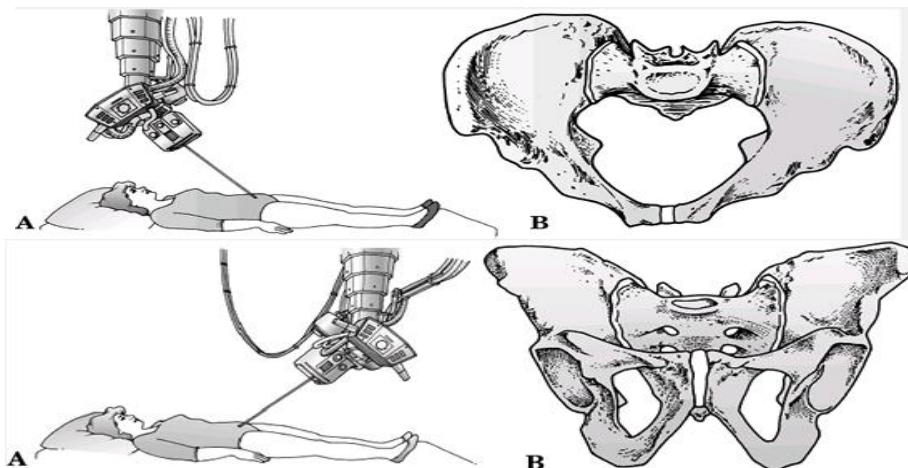
Type c fracture there is diasthesis of SP & vertical shear & SIJ (Sacro iliac joint) involvement → in this type the force cause separation and one fragment goes higher than the other

**Radiological examination:**

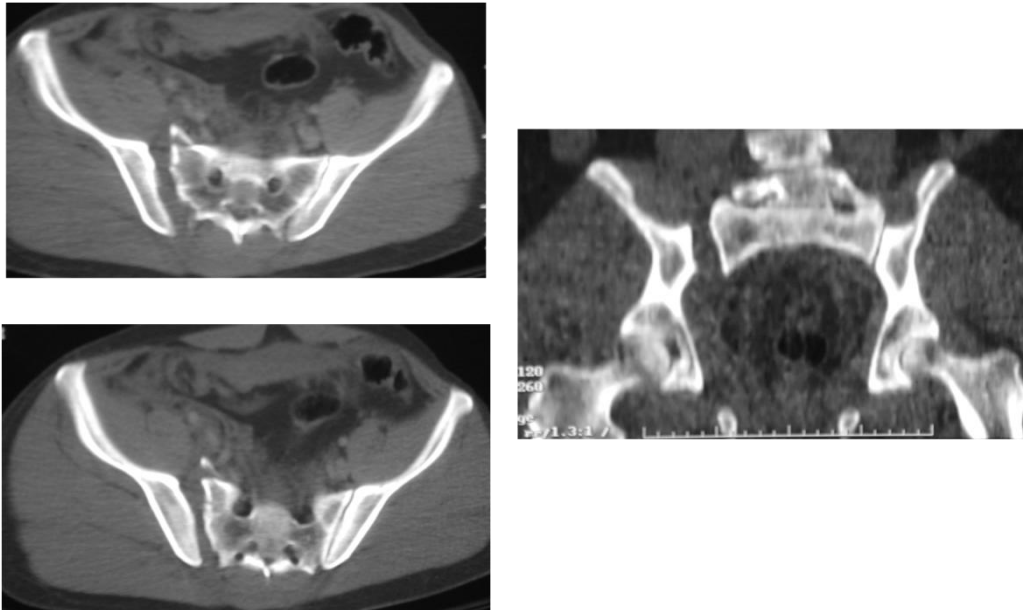
Q: which one is the normal AP?

RADIOGRAPHIC EVALUATION:

- AP of the pelvis
- Inlet radiograph
- Outlet radiograph
- Computed tomography
- Magnetic resonance imaging for any Soft tissue Injury.



CT give you clear idea about bony & soft tissues you can assess the degree of distrubtion
 Coronal CT here showing distrubtion in anterior & posterior of LT SIJ



MANAGEMENT

- Aggressive treatment. By A.B.C. D → مهمه دائما عاملها كحاله طوارئ – سؤال
- Think in systemic approach. (it is not always bone think about the structure inside: Urinary badder, nerves, vessels, etc)
- Specific treatment:

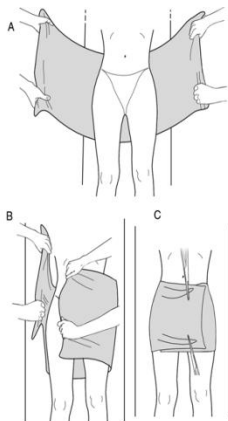
Type A. Bed rest& symptomatic treatment (conservative) MCQ

Type B. ORIF with plates & screws, External Fix. MCQ

Type C. ORIF with plates & screws. Both AP. MCQ

Type A have the best Prognosis, and the worst is Type C because type C requires a very high energy to cause it!

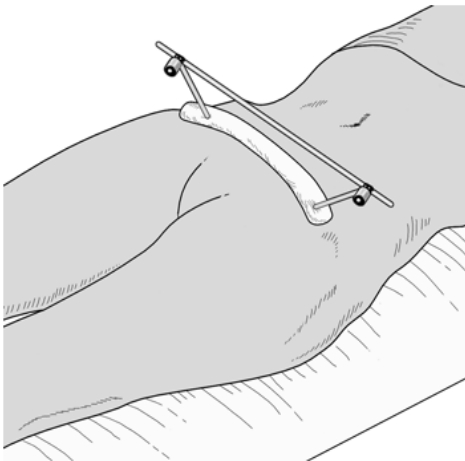
- **Pelvic banding** مهمه جدا (to prevent expansion especially in open book fracture. usually the patient present with hypovolemic Shock) it can be applied at the site of accident also. → 1st step مهمه



Source: Simon RR, Sherman SC, Koenigsnecht SJ: Emergency Orthopedics, The Extremities, 5th Edition: <http://www.accessmedicine.com>
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Circumferential pelvic anti-shock sheeting. A. A sheet is placed under the pelvis. B. The ends are brought together anteriorly. C. Hemostats are used to secure the sheet snugly.

○ **external fixation**



Source: Simon RR, Sherman SC, Koenigsnecht SJ: *Emergency Orthopedics, The Extremities*, 5th Edition; <http://www.accessemergencymedicine.com>

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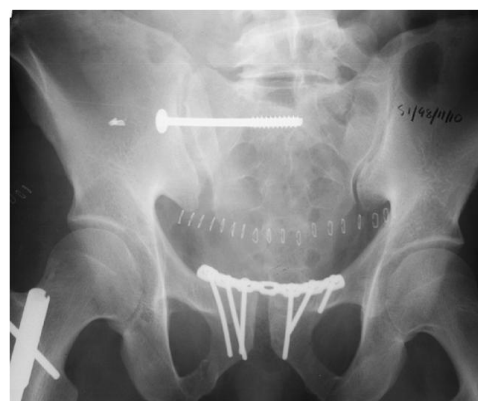
Anterior external fixator.

Operative treatment

1- Surgical correction of type B open book fracture by anterior plating [ORIF]



2-Surgical correction of type C fracture by percutaneous screw & plating of SP anterior (ORIF)



Complications

- Infection up to 25%
- Thromboembolism
- Malunion
- Nonunion
- Hemorrhage –life threatening –hypovolemic shock
- Bladder (15%)/bowel injuries
- Neurological damage (L5-S1)
- Obstetrical difficulties
- Persistent sacro-iliac joint pain → common and no treatment for it

2- Hip fractures (Neck,intertrochantric):

- Fractures of the proximal femur are classified first according to their anatomical location.
- Femoral neck fractures and intertrochanteric fractures occur with about the same frequency.
- They are both more common in women than in men by a margin of three to one.
- It is a result of MVA, fall.

HIP FRACTURE

Epidemiology

- ☐ common fracture in elderly (greater incidence of osteopenia)
- ☐ female > male
- ☐ in osteopenic individual, fracture may precede simple fall (muscle stronger than bone)
- ☐ in younger individual, fracture related to high energy injury
 - markedly displaced
 - associated with other injuries

Diagnosis

- ☐ characteristic history, unable to bear weight on affected limb
- ☐ limb shortened, externally rotated, painful ROM, antalgic gait
- ☐ obtain AP of pelvis and lateral of involved hip
- ☐ if findings equivocal - bone scan and tomograms

2/ A

1. Subcapital Fractures

- ☐ fracture between femoral head and intertrochanteric line
- ☐ main vascular supply to femoral head from distal arterial ring to proximal head through femoral neck
- ☐ fracture interrupts blood supply
 - articular surface restricts blood supply to femoral head
 - AVN risk depends on degree of displacement

Table 12. Garden Classification of Subcapital Fractures

Type	Extent	Displacement	Alignment	Trabeculae
1	Incomplete	Impacted	Valgus	Malaligned
2	Complete	None	Neutral	Aligned
3	Complete	Some	Varus	Malaligned
4	Complete	Marked	Varus	Aligned

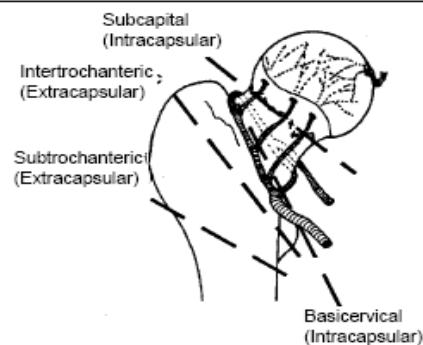
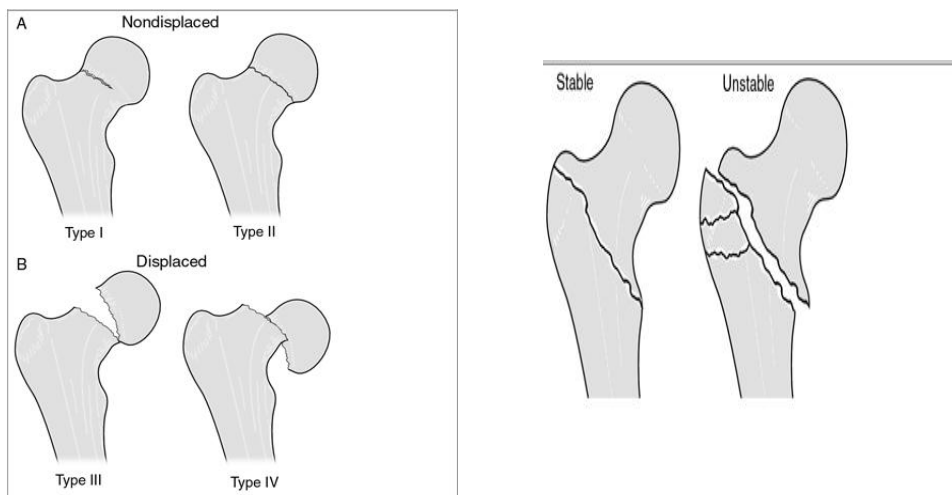
Treatment

- ☐ if needed, treat osteoporosis
- ☐ restore anatomy, attempt to save head (AVN head CAN heal)
- ☐ type of treatment depends on displacement and patient age
- ☐ undisplaced (Garden 1,2) - ORIF to prevent displacement
- ☐ displaced (Garden 3,4) - depends on patient
 - older patient, poor health → unipolar hemiarthroplasty
 - younger patient with higher demand lifestyle → bipolar hemiarthroplasty vs. total hip replacement vs. reduction and internal fixation
 - younger patient with OA of hip → total hip replacement

Complications

- ☐ AVN
- ☐ non-union

Remember the supply to the femoral Head? 3 arteries!

**Figure 21. Blood Supply to Femoral Head and Fracture Classification**

2/B

2. Intertrochanteric Fracture

- ☐ extra-capsular fracture, therefore good femoral head viability
- ☐ fracture stability determined by amount of compromise to calcar femorale (medial cortex at neck/shaft junction)
- ☐ greater and lesser trochanters may be separate fragments
- ☐ posterior fragment may be avascular, therefore possible delayed union

Classification

- ☐ 2 part - stable, trochanter intact
- ☐ 3 part - one trochanter separated, unstable if large calcar fragment
- ☐ 4 part - unstable, both trochanters separated

Treatment

- ☐ ORIF (sliding hip screw) to preserve femoral head
- **NB :the Intertrochanteric fractures usually :**
- **Extracapsular**
- **Heals well, low risk for osteonecrosis → heals well because it is Metaphesal fracture and it has low risk of oseonecrosis because it has low blood supply**
- **elderly, osteoporotic women**
- **Simple fall**

NB :

Femoral neck(transcervical) fractures

- **Risk of osteonecrosis** مهمه – سؤال
- **High and low mechanism of injuries(young Vs elderly)**
- **Evaluation as for IT fractures**

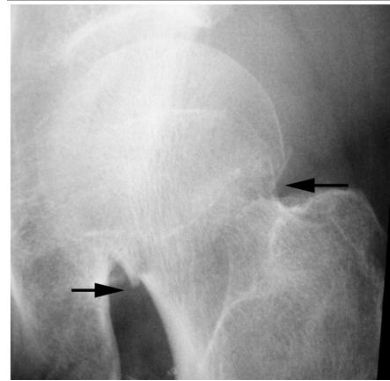
Clinical picture :

- **Inability to bear-weight**
- **Limb is short, abducted and externally rotated**

Radiological evaluation

- **AP and lateral(cross-table)**

Group A1



Type 2

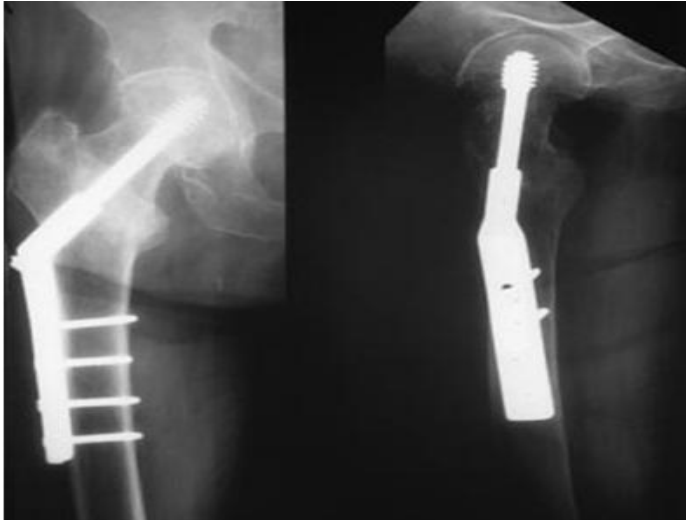


Treatment:

**NO rule for non-operative
For neck and intratrochantric
Femur fractures**

- Usually operative **MCQ**

Dynamic hip screw(DHS)



Proximal femoral nail



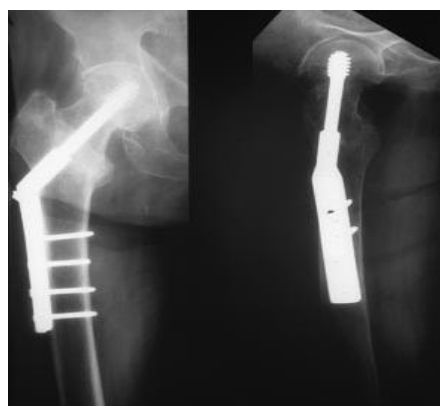
Treatment neck of femur

Nondisplaced fracture of neck of femur can be treat with canulated screws



Depends on the age!

Displaced fracture: DHS in patient less **than 60 years.**



Age > than 65 years look for.

. Level of activities.

. Status of the acetabulum.

Then chose THR (if acetabulum is disease!) vs. hemi arthroplasty.



COMPLICATIONS:

- Nonunion: 5% of nondisplaced fractures and up to 25% of displaced fractures
12 months as groin or buttock pain
- Osteonecrosis: 10% of nondisplaced fractures and up to 27% of displaced fractures.
- Fixation failure: osteoporotic bone or technical problems

3- Femoral shaft Fractures:**FEMORAL DIAPHYSIS FRACTURES**

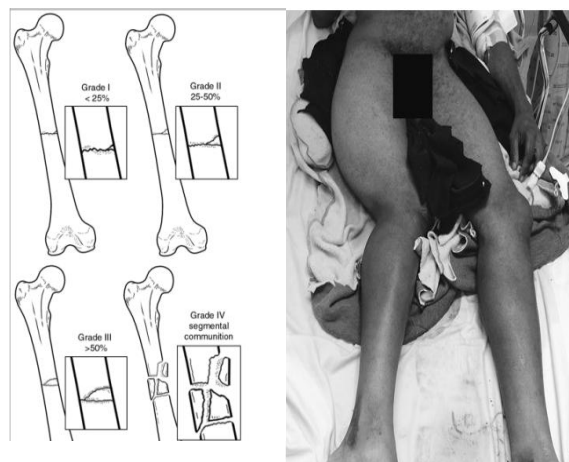
- ☐ high energy (MVA, fall from height, gunshot wounds)
- ☐ low energy (spiral fracture in children)
- ☐ high morbidity/mortality (hemorrhage, fat embolism, ARDS, MODS)
- ☐ blood replacement often required
- ☐ frequently comminuted
- ☐ soft tissue trauma

Clinical

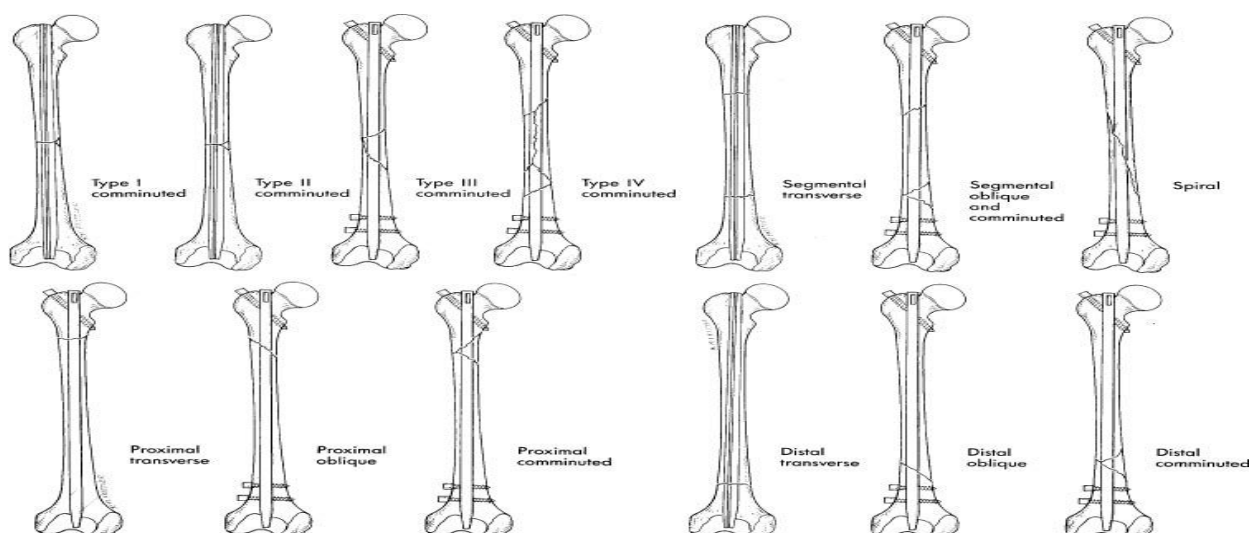
- ☐ leg is shortened, externally rotated
- ☐ unable to weight bear
- ☐ assess neurovascular status
- ☐ r/o: open fracture, soft tissue compromise
- ☐ r/o: child abuse with spiral fractures in children

Treatment

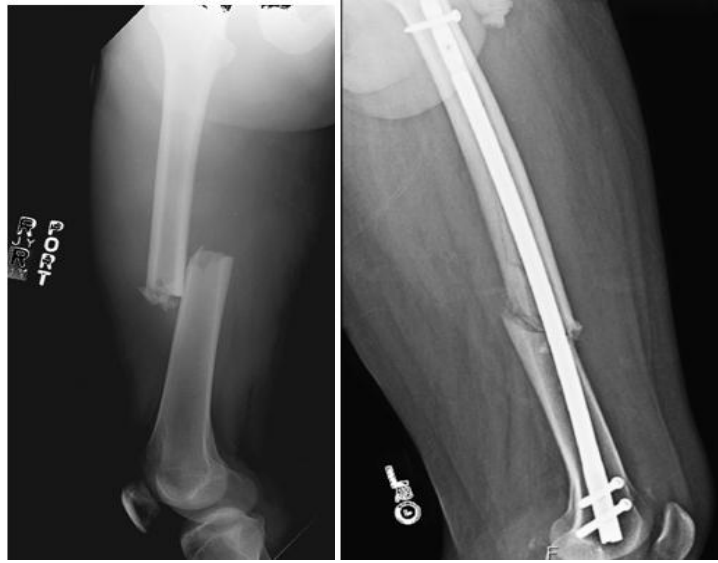
- ☐ ABCs of trauma are essential
- ☐ immobilize leg with Thomas Splint
- ☐ adequate analgesia
- ☐ surgical fixation (intramedullary nail) within 24 hours
 - high rate of surgical union after 6 to 12 weeks
- ☐ early mobilization of hip and knee



The best treatment of is I.M.N



Mid shaft femur fracture, Intramedullary femoral nail (best Treatment) → because it is secondary treatment → WE do not touch the hematoma so it heals faster مهمه



Open reduction and plate fixation for femur fracture → this type is primary treatment (the hematoma cleaned) → it is slower



4- Tibia shaft fracture:**TIBIAL DIAPHYSIS FRACTURE**

- ☐ high intensity injury
 - associated with crush injuries and MVAs →
- ☐ soft tissue, nerve and vessel injury common
 - assess neurovascular status
 - r/o open fracture
- ☐ displacement is difficult to control
- ☐ good reduction is required
 - shortening: < 1 cm
 - angulation in varus/valgus plane: < 5 degrees
 - angulation in antero-posterior plane: < 10 degrees
 - rotation neutral to slight external rotation
 - apposition: ≥ 50%
- ☐ healing time: 16 weeks on average

Crush injury – MCQ

Treatment

- ☐ ABCs
- ☐ closed injuries = closed reduction
 - long leg cast x 4-6 weeks
 - followed by BK cast until healed
- ☐ open injuries
 - ORIF with external fixator
 - wounds on anterior surface heal poorly and may necrose
- ☐ unstable injuries or failed closed reduction require IM nail
- ☐ high risk of compartment syndrome →
 - closed reduction and cast; admit and observe for compartment syndrome surgery; prophylactic fasciotomy if operating on tibia fracture

MCQ : common site

How Many Compartments Syndrome in the leg? (IMPORTANT)**Table 16-1. Related Anatomy of Tissue Compartments of the Leg**

Compartment	Muscles	Vessels	Nerves	Pain
Anterior	Anterior tibialis, extensor hallucis longus, extensor digitorum longus, peroneus tertius	Anterior tibial artery	Deep peroneal	Ankle plantar flexion, toe flexion
			• Weakness: Ankle dorsiflexion, toe extension	
			• Paresthesia: Web space of 1st and 2nd toes	
Lateral	Peroneus longus and brevis	None	Superficial peroneal	Ankle plantar flexion, foot inversion
			• Weakness: Ankle dorsiflexion, foot eversion	
			• Paresthesia: Dorsum of foot	
Deep Posterior	Posterior tibialis, flexor digitorum longus, flexor hallucis longus	Peroneal artery, posterior tibial artery	Posterior tibial	Ankle dorsiflexion, foot eversion, toe extension
			• Weakness: Ankle plantarflexion, foot inversion, toe flexion	
			• Paresthesia: Plantar aspect of foot	
Superficial Posterior	Gastrocnemius, soleus, plantaris	None	Sural	Ankle dorsiflexion
			• Weakness: Ankle plantarflexion	
			• Paresthesia: Lateral foot	

Group A1**Classification (descriptive):**

- Open versus closed
- Anatomic location: proximal, middle, or distal third
- Fragment number and position: comminution, butterfly fragments
- Configuration: transverse, spiral, oblique
- Angulation: varus/valgus, anterior/posterior
- Shortening
- Displacement: percentage of cortical contact
- Rotation
- Associated injuries

CLINICAL EVALUATION

- Evaluate neurovascular status
- Assess soft tissue injury
- Rule out (R/o) open fracture
- Monitor for compartment syndrome
- Assess for knee ligament injuries

Clinical examination

Look to injured limb for.

- Soft tissue condition
- R/O open fracture
- Deformity

Feel for: Tenderness, pain.

Move: ROM



R/o and start treatment for open



Group A1**Radiological study** التصنيف مهم جدا – سؤال

1- Spiral # of distal tibia \\ twisting injury:

2-Transverse # of distal tibia caused more sever inj. To soft tissues due to direct trauma



AP view of mid shaft tibia



Lateral view showing two joints



Treatment: (best treatment is intramedullary)

- NON operative:

By casting if

- a. Shortening <1cm
 - b. Angulation in varus/valgus plane < 5 degree
 - c. Angulation in anter-posterior plane <10 degrees
 - d. Rotation neutral to slight external rotation.
 - e, bone apposition >50%
- Cast with the knee in 0 to 5 degrees of flexion
 - After 4 to 6 weeks, the long leg cast may be exchanged for a patella-bearing cast or fracture brace.
 - Union rates as high as 97% are reported, although with delayed weight bearing related to delay union or nonunion. (the problem is Prolong Casting)
 - The average union time is 16 ± 4 weeks



- Operative treatment:

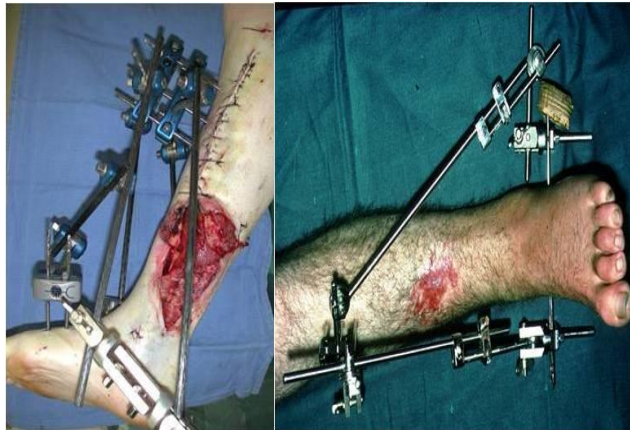
- The best treatment for mid shaft tibia fracture is Intramedullary (IM) Nailing But the most complication is anterior knee pain!!



Other Method of Fixation: External fixation:

Indication for E. F:

- Open fracture 3
- Soft tissue injury (burn, blister, infection)
- poly trauma
- Fracture with vascular injury

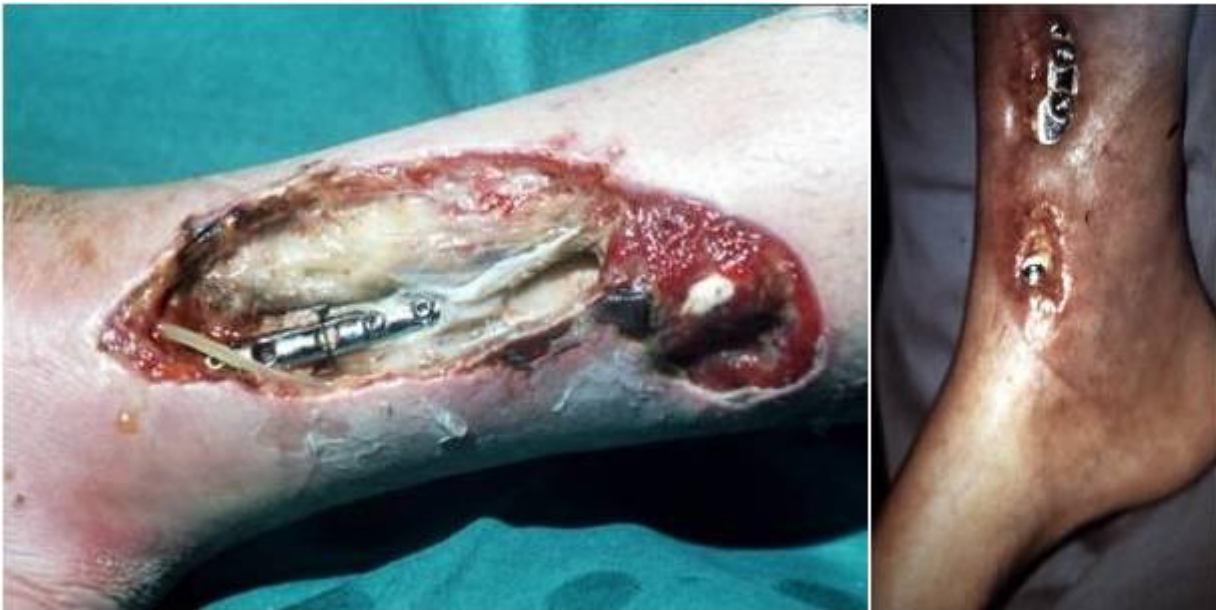


Union rates: Up to 90%, with an average of 3-6 months to union

The incidence of pin tract infections is 10% to 15%.

Plates and Screws: (The problem sometimes there is nothing to cover the proximal Tibia either muscles or soft tissue) Prone to Infections More! لها اعراض جانبية كثيرة لذلك لا تستخدم كثيرا – سؤال

- Fractures extending into the metaphysis or epiphysis.
- Success rates as high as 97%. Complication rates of infection, wound breakdown, and malunion or nonunion increase with higher-energy injury patterns.



Note: If the Patient Refuses the Cast (which is for a long period), he may go for a surgery directly!

5- Ankle Fractures:

EPIDEMIOLOGY

- the incidence of ankle fractures has increased
- an elderly women
- Most ankle fractures are isolated malleolar fractures
- **Open fractures are rare < 2%**

MECHANISM OF INJURY

- position of the foot at time of injury,
- The magnitude, direction, and rate of loading.

CLINICAL EVALUATION

- ranging from a limp to nonambulatory in significant pain and discomfort, with swelling, tenderness, and variable deformity
- Neurovascular status
- The extent of soft tissue injury possible open injuries and blistering
- A dislocated ankle should be reduced and splinted immediately (before radiographs if clinically evident)

RADIOGRAPHIC EVALUATION

AP view: (you are looking for the joint space)

- Tibiofibula overlap of <10 mm is abnormal and implies syndesmotic injury.
- Tibiofibula clear space of >5 mm is abnormal and implies syndesmotic injury
- Talar tilt



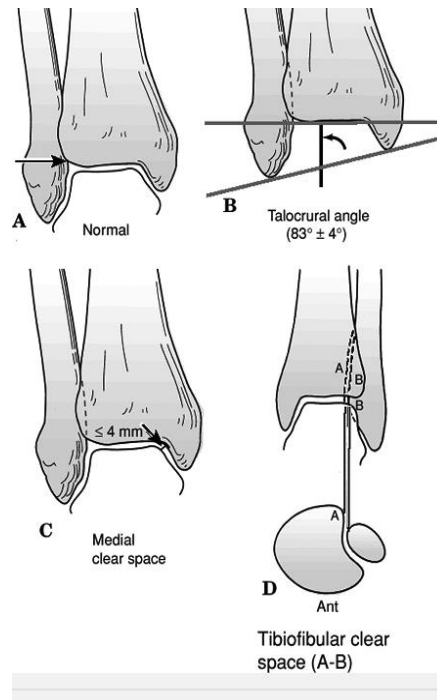
Lateral view:

- The dome of the talus should be centered under the tibia and congruous with the tibial plafond
- Posterior tibial tuberosity fractures can be identified



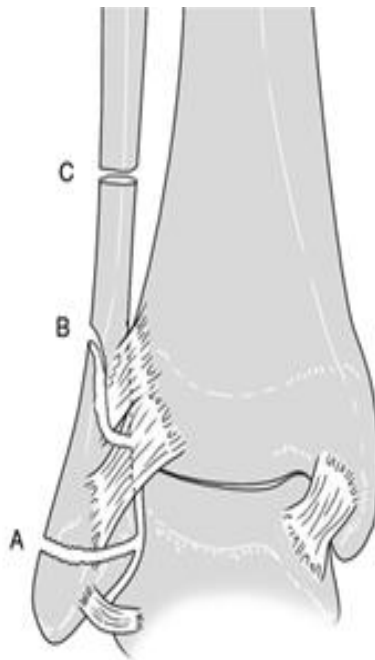
Mortise view:

- the foot in 15 to 20 degrees of internal rotation
- A medial clear space >4 to 5 mm is abnormal and indicates lateral talar shift
 - Tibiofibular overlap <1 cm indicates syndesmotic disruption
 - Talar shift >1 mm is abnormal.



Denis –weber classification: (Depends at the relation of a Muscle)

- infra-syndesmotiC
- Trans-syndesmotiC
- supra-syndesmotiC



Danis-Weber Classification

- ☐ level of fibular fracture relative to tibial plafond
- ☐ Type A (infra-syndesmotic)
 - pure inversion injury
 - avulsion of lateral malleolus below plafond or torn calcaneofibular ligament
 - +/- shear fracture of medial malleolus
- ☐ Type B (trans-syndesmotic)
 - external rotation and eversion
 - avulsion of medial malleolus or rupture of deltoid ligament
 - spiral fracture of lateral malleolus starting at plafond
- ☐ Type C (supra-syndesmotic)
 - pure external rotation
 - avulsion of medial malleolus or torn deltoid ligament
 - fibular fracture is above plafond
 - frequently tears syndesmosis
 - Maisonneuve fracture if at proximal fibula
 - posterior malleolus avulsed with posterior tibio-fibular ligament

Treatment

- ☐ undisplaced fractures: NWB BK cast
- ☐ displaced fractures: reduction asap
- ☐ indications for ORIF
 - all fracture-dislocations
 - all type C fractures
 - trimalleolar (lateral, medial, posterior) fractures
 - talar shift or tilt
 - failure to achieve or maintain closed reduction
- ☐ prognosis dependent upon anatomic reduction
 - high incidence of post-traumatic arthritis

NWB BK= Not- wight bearing below 

Treatment:

1- Stable weber B fracture (BKC)



2-Bimalleolar fracture need ORIF



Displaced MM fracture --ORIF



Tri malleolar fracture --ORIF



X-ray showed

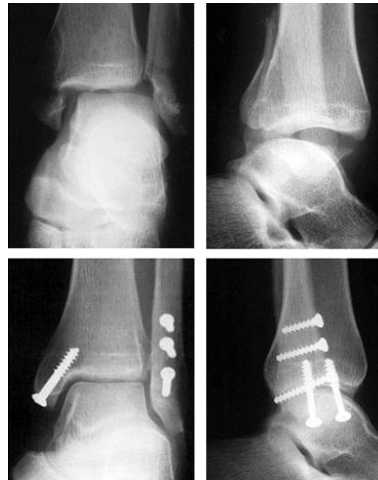
Bimalleolar ankle fracture with talarsubluxation and tilting

Treatment

ORIF



Bimalleolarfracture ---Percutaneous screw fixation



Complications:

- Post traumatic arthritis. Common
- Stiffness.
- Skin necrosis.
- Malunion or nonunion.
- Wound infection.
- Regional complex pain syndrome.

Summary:

- 1- Know the Mechanism!
- 2- Always Rule out Open Fractures. ATLS IS IMPORTANT
- 3- Treatment : Operative Treatment is Better to maintain Function status as soon as possible
- 4- COMPARTMENT SYNDROME
- 5- Hip Fracture! (When To Operate)
- 6- The Most common early Complication In open Pelvic Fracture is BLEEDING!
- 7- The Most common Is Post Traumatic Arthritis In pelvic Fractures.
- 8- The Most common Complication in the Forearm is MALUNION!

Done 2/2