

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:

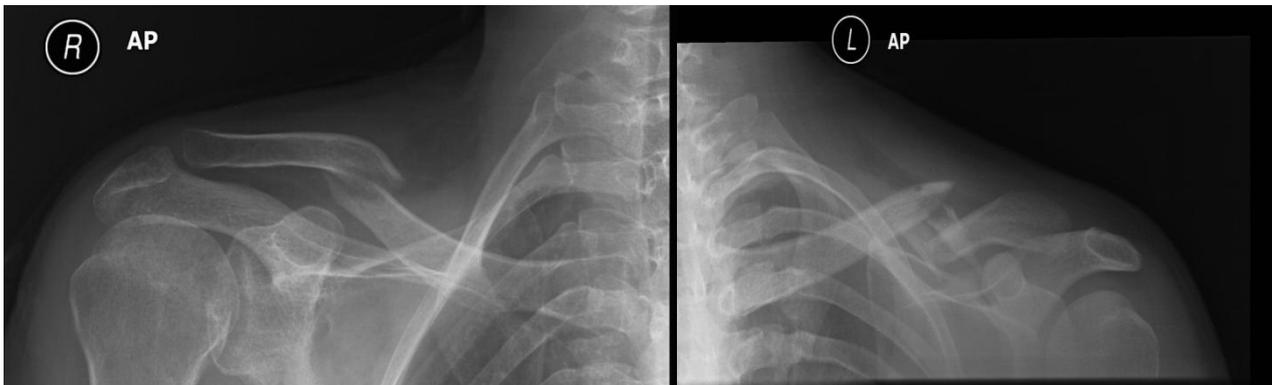
- The clavicle functions as a strut, bracing the shoulder from the trunk and allowing the shoulder to function at optimal strength
 - Incidence: 5% Proximal Third of The clavicle, 80% middle Third of The Clavicle (most common ميهه), 15% Distal Third of the Clavicle.
 - Common In Children (Unites Rapidly 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** مهمه

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

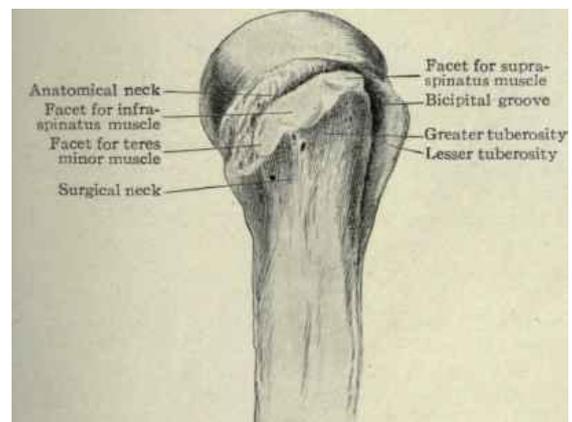
B- Humerus Fractures:

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.

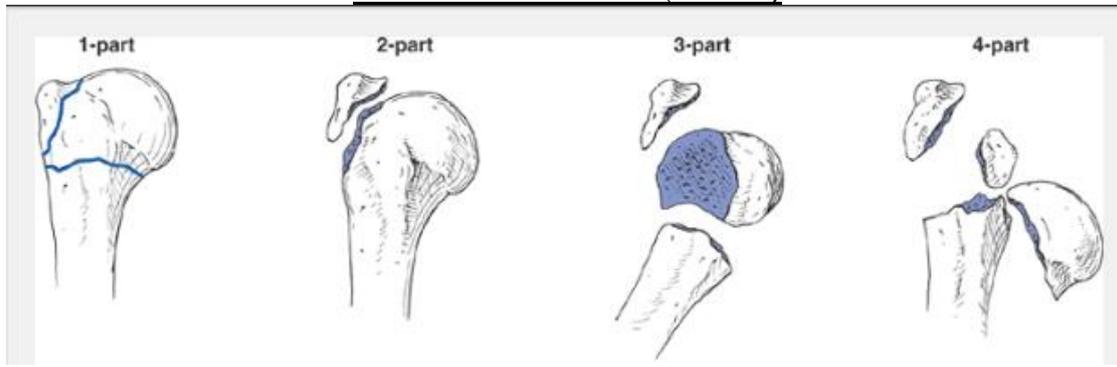
Motor: movement of the Deltoid muscle

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 < 1cm and/or angulation < 45 degree.

2- Displaced: Displacement is > 1cm and /or angulation > 45 degree.

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

So,

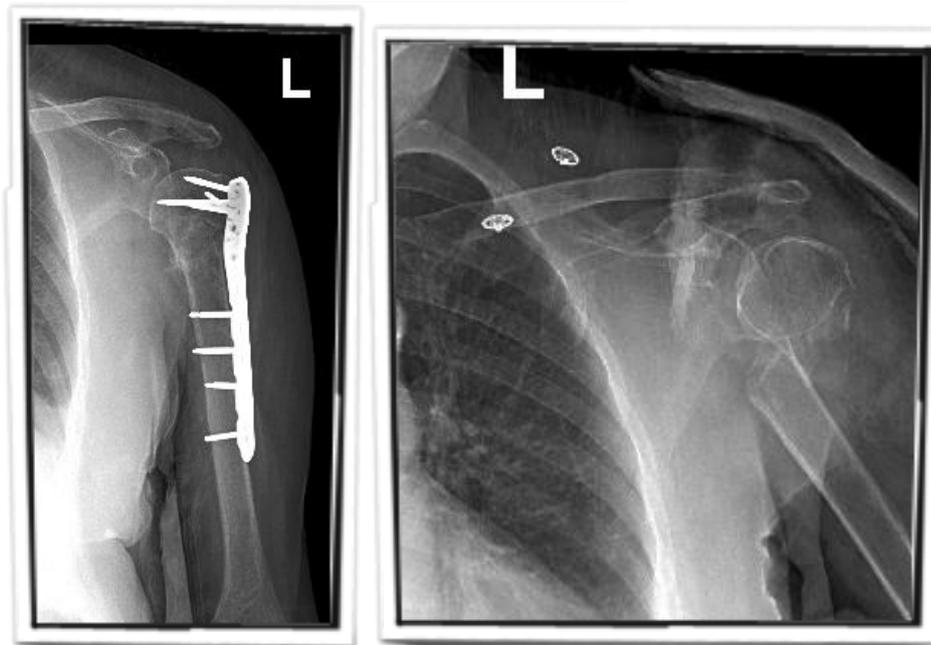
- **Two-part Fracture:** Any of the 4 parts with 1 displaced
- **Three part Fracture:** Displaced fracture of the surgical Neck + displaced greater tuberosity or lesser tuberosity.
- **Four- part Fracture:** Displaced fracture of Surgical Neck + both Tuberosities.

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 fracture

ORIF 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

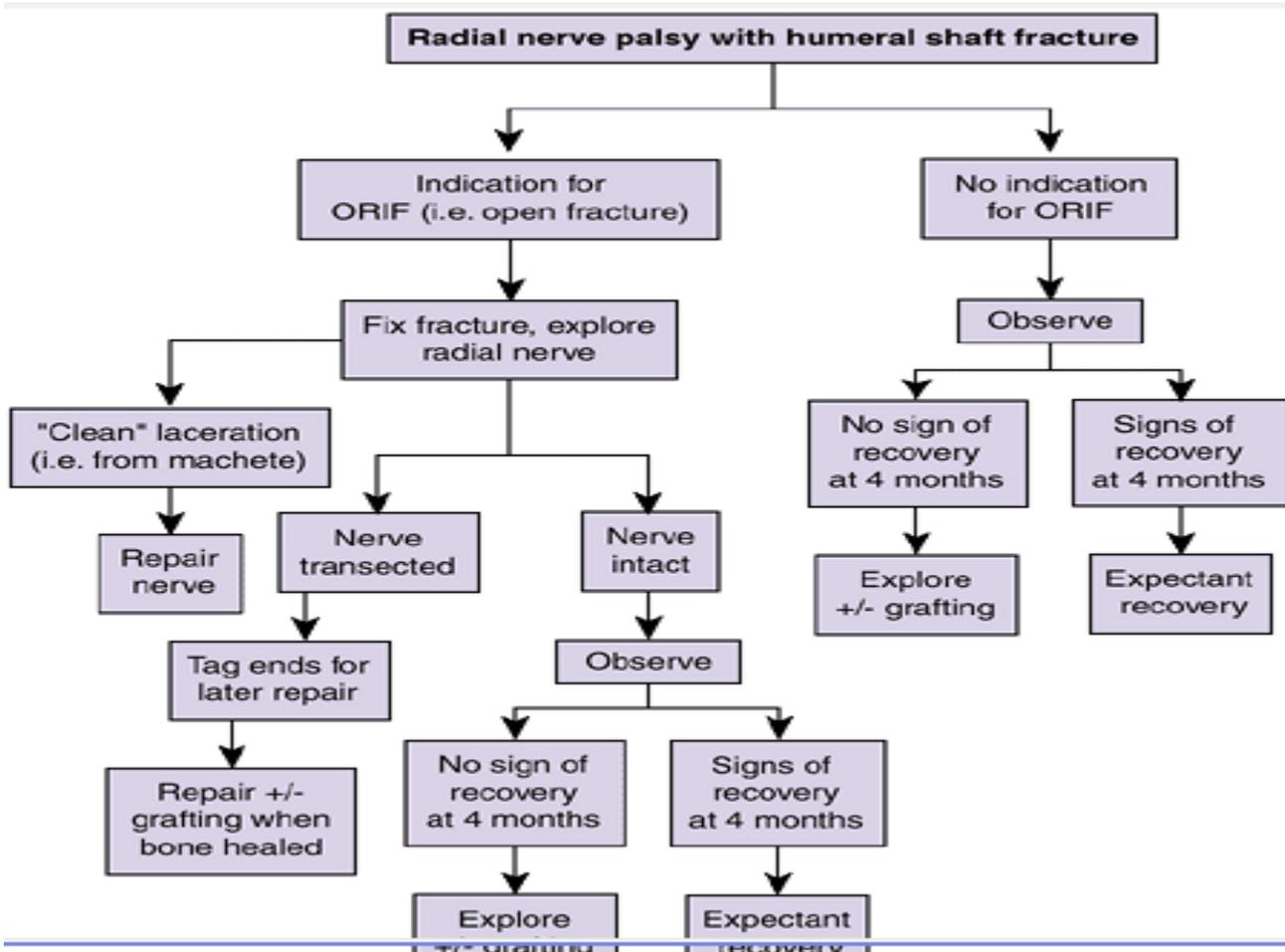
• **Radial Nerve Injury (Wrist drop):**

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.

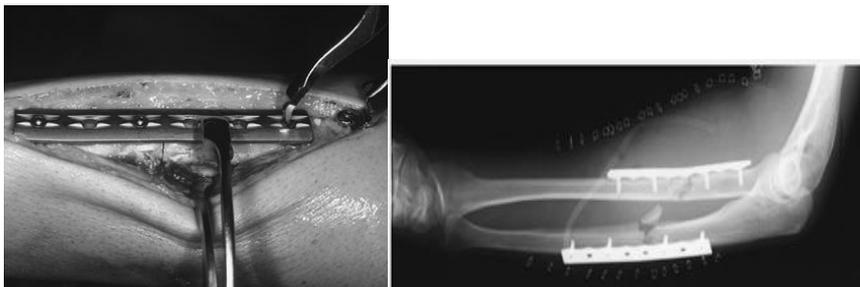
1- Operation:

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. Volkman ischemia follows Compartment Syndrome. → MCQ

e. Posttraumatic radioulnarsynostosis (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:

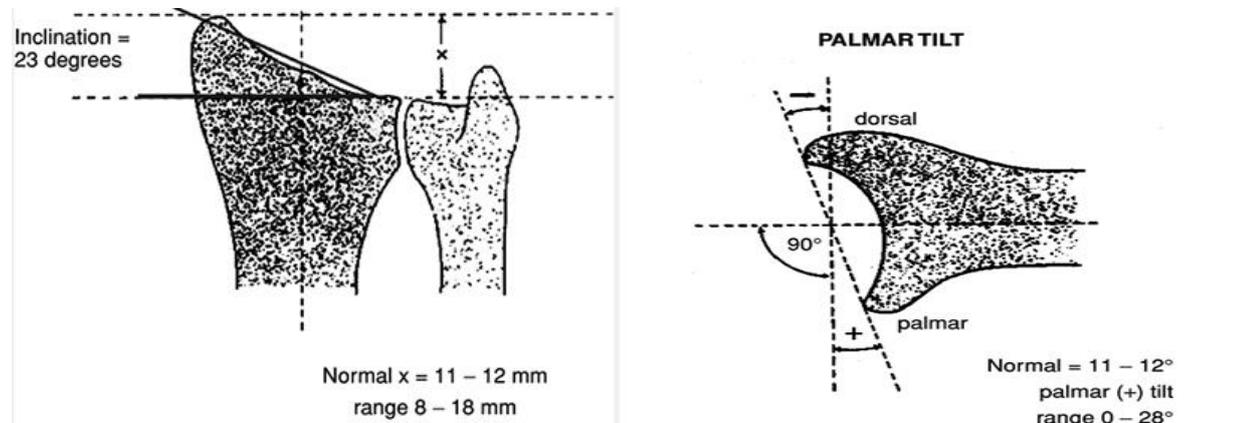
Posteroanterior and lateral views

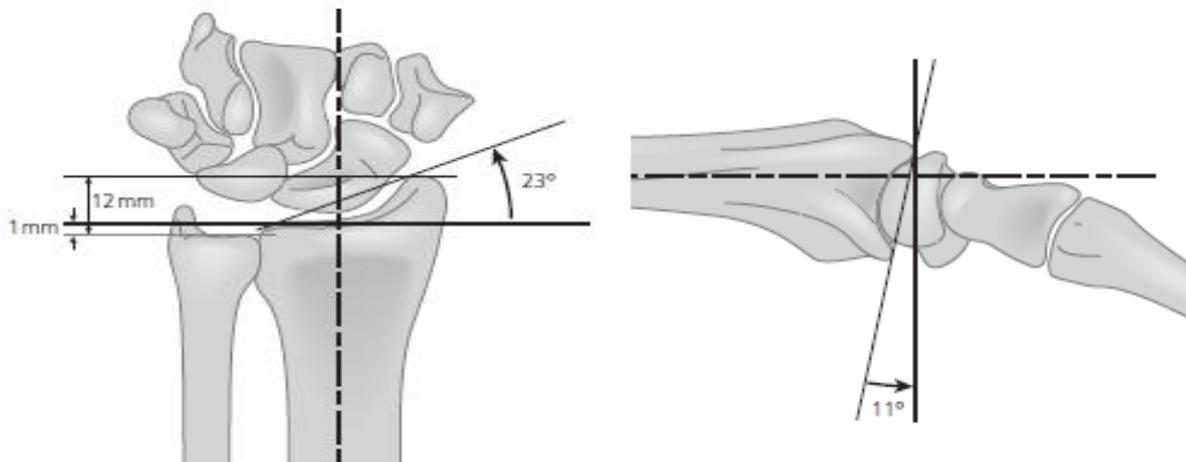
Normal radiographic relationships

a. Radial inclination: averages 23 degrees (range, 13 to 30 degrees) مهم

b. Radial length: averages 11 mm (range, 8 to 18 mm). (مهم - اضربها ب 2 لتحصل على a)

c. Palmar (volar) tilt: averages 11 to 12 degrees (range 0 to 28 degrees).





Radiological Evaluations

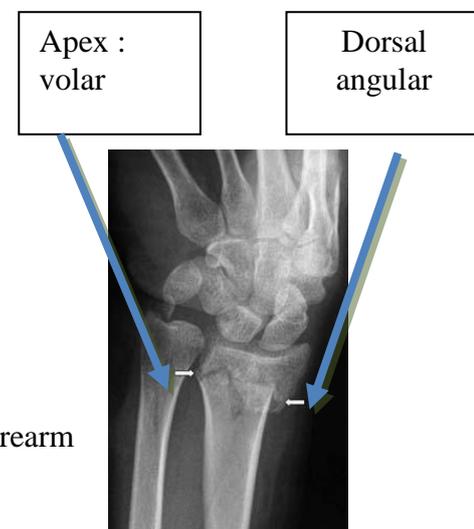


CLASSIFICATION (Descriptive):

- 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)



•

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.

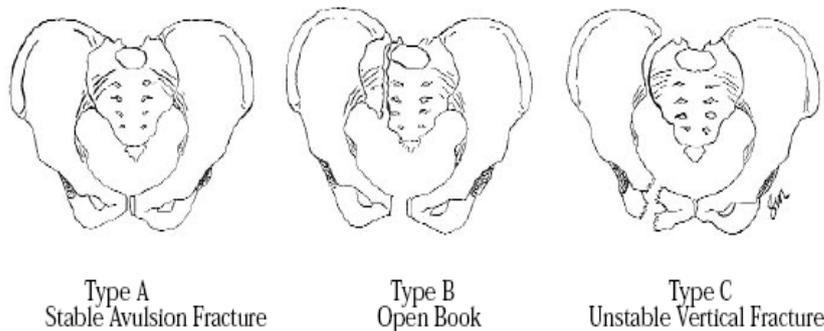


Figure 20. Illustration of the Tile Classification of Pelvis Fractures

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



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



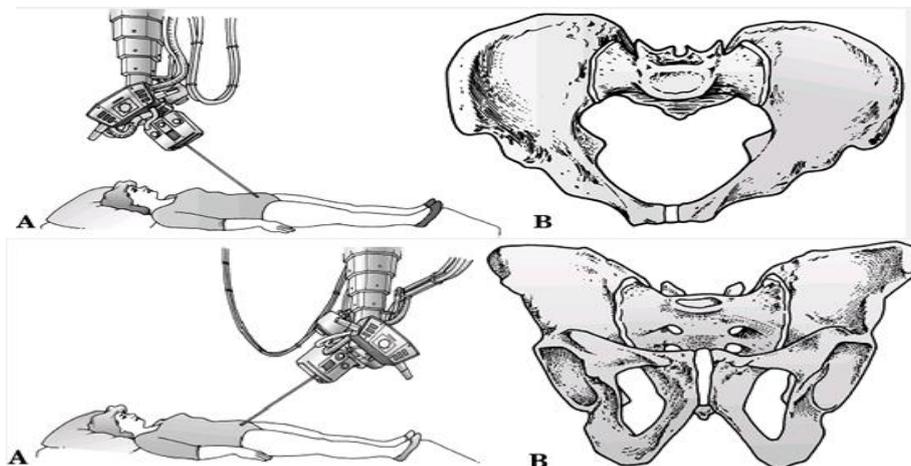
Radiological examination:



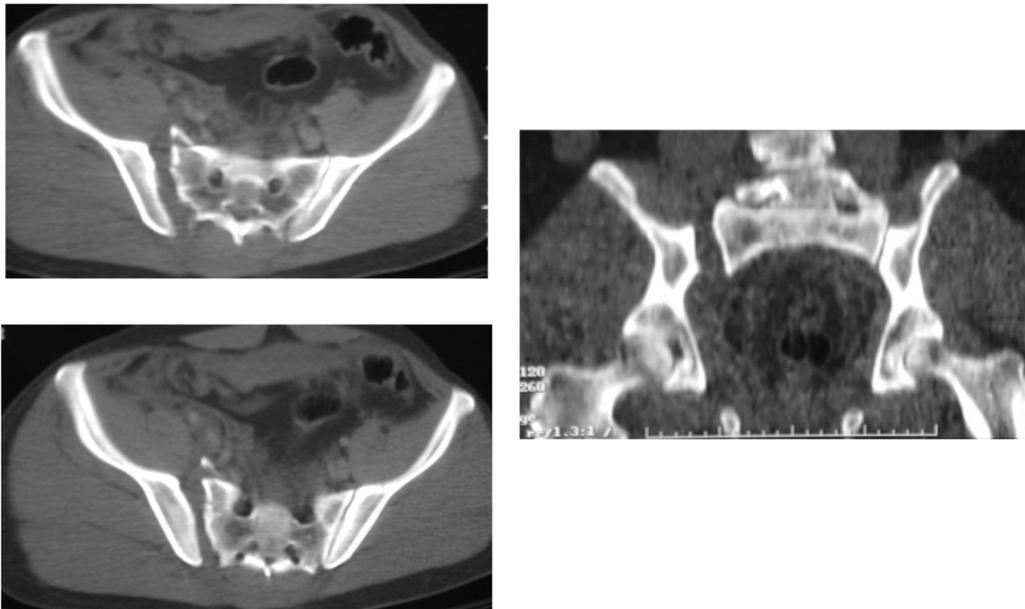
Q: which one is the normal AP?

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 - سوال
- Think in systemic approach. (it is not always bone think about the structure inside: Urinary badder, nerves, vessels, etc)
- Specific treatment:

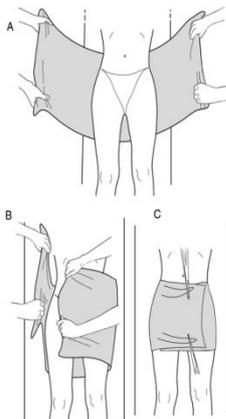
Type A. Bed rest& symptomatic treatment (conservative) MCQ

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!

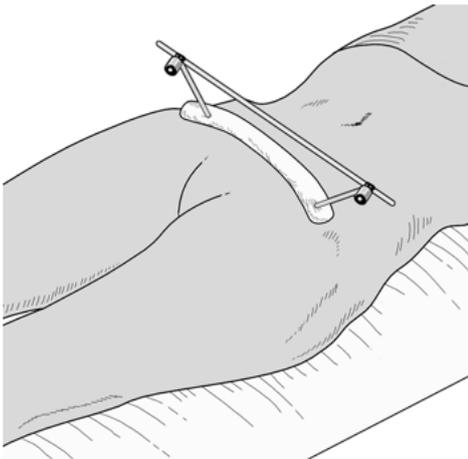
- **Pelvic banding** مهمه جدا (to prevent expansion especially in open book fracture. usually the patient present with hypovolemic Shock) it can be applied at the site of accident also. → 1st step مهمه



Source: Simon RR, Sherman SC, Koenigskecht SJ. Emergency Orthopedic, 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**



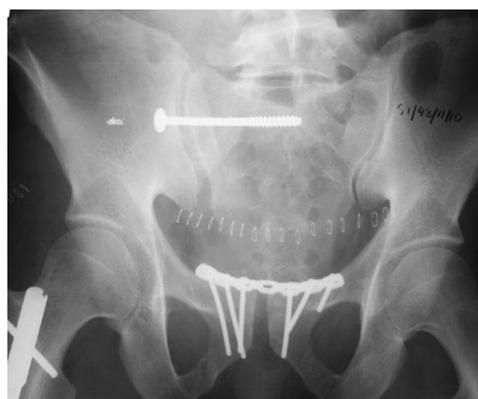
Source: Simon RR, Sherman SC, Koenigsnecht SJ: *Emergency Orthopedics, The Extremities*, 5th Edition: <http://www.accessemergencymedicine.com>
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Anterior external fixator.

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!

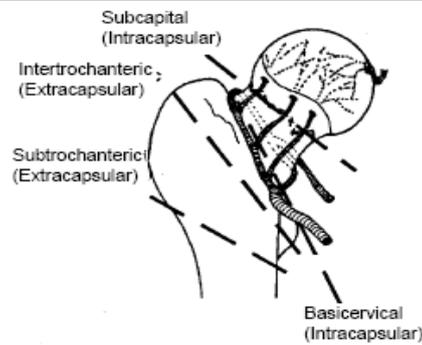
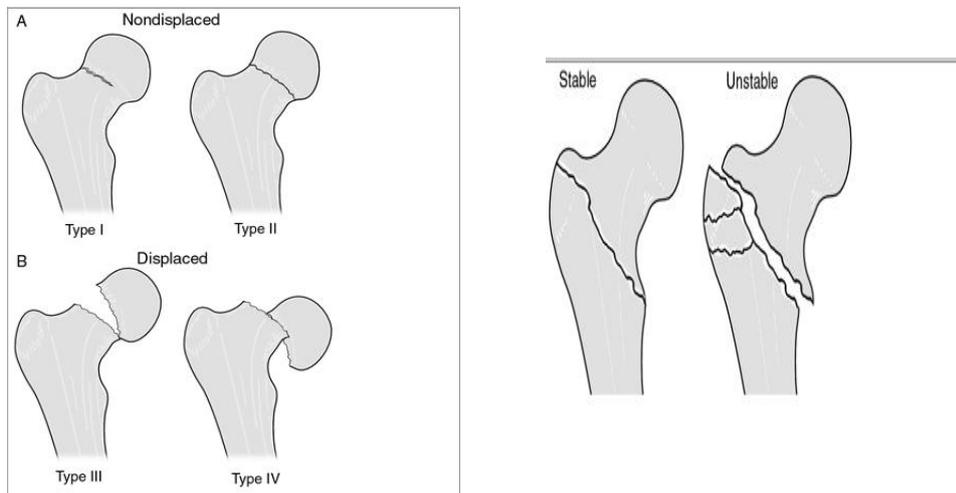


Figure 21. Blood Supply to Femoral Head and Fracture Classification



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

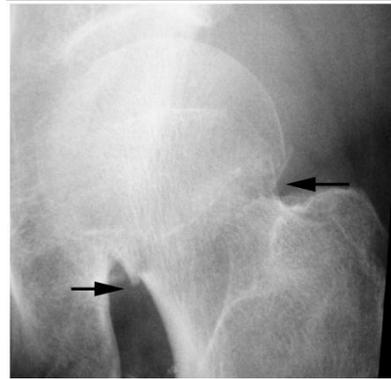
- **Risk of osteonecrosis** مهمه – سؤال
- **High and low mechanism of injuries(young Vs elderly)**
- **Evaluation as for IT fractures**

Clinical picture :

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

Radiological evaluation

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



Type 2

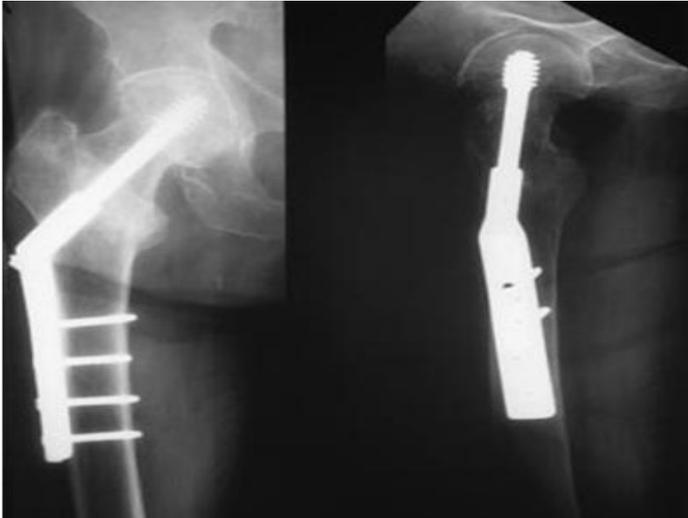


Treatment:

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

- Usually operative **MCQ**

Dynamic hip screw(DHS)



Proximal femoral nail



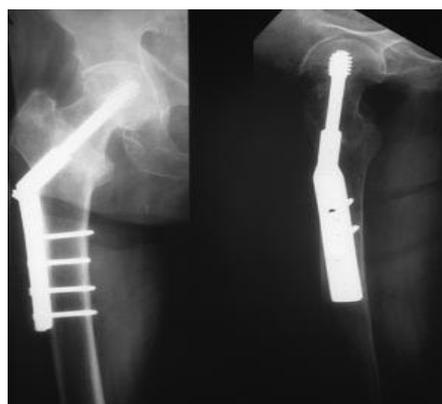
Treatment neck of femur

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

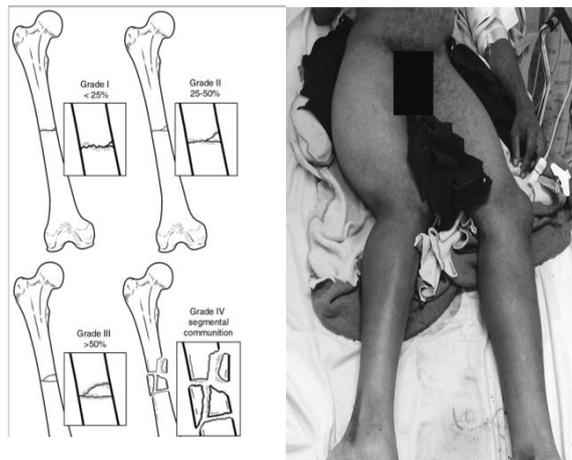
- high energy (MVA, fall from height, gunshot wounds)
- low energy (spiral fracture in children)
- high morbidity/mortality (hemorrhage, fat embolism, ARDS, MODS)
- blood replacement often required
- frequently comminuted
- soft tissue trauma

Clinical

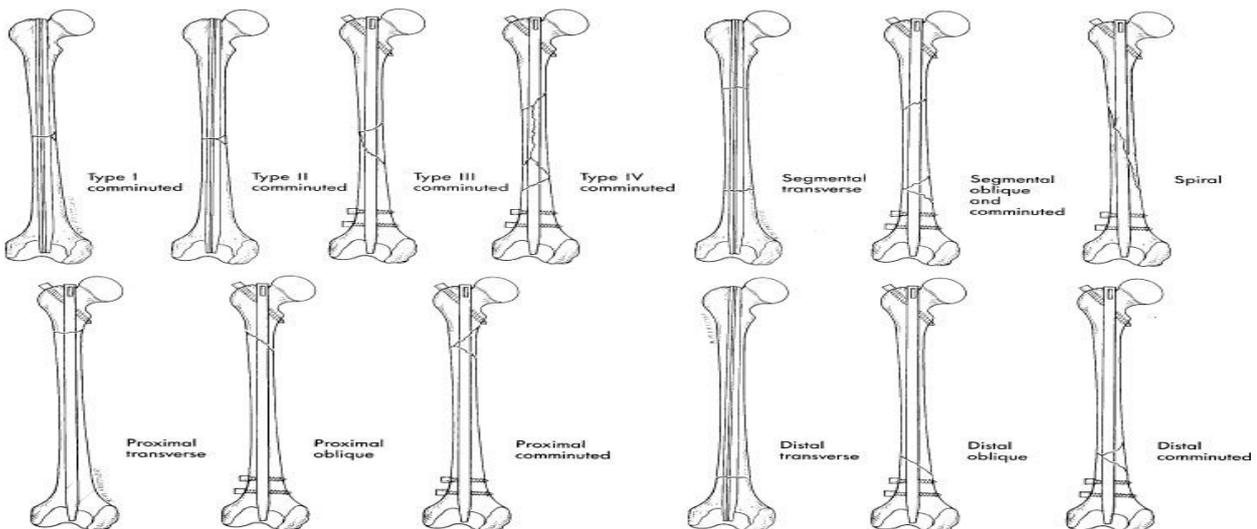
- leg is shortened, externally rotated
- unable to weight bear
- assess neurovascular status
- r/o: open fracture, soft tissue compromise
- r/o: child abuse with spiral fractures in children

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



Group A1

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
			<ul style="list-style-type: none"> • 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
			<ul style="list-style-type: none"> • 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
			<ul style="list-style-type: none"> • Weakness: Ankle plantarflexion, foot inversion, toe flexion • Paresthesia: Plantar aspect of foot 	
Superficial Posterior	Gastrocnemius, soleus, plantaris	None	Sural	Ankle dorsiflexion
			<ul style="list-style-type: none"> • Weakness: Ankle plantarflexion • Paresthesia: Lateral foot 	

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



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:

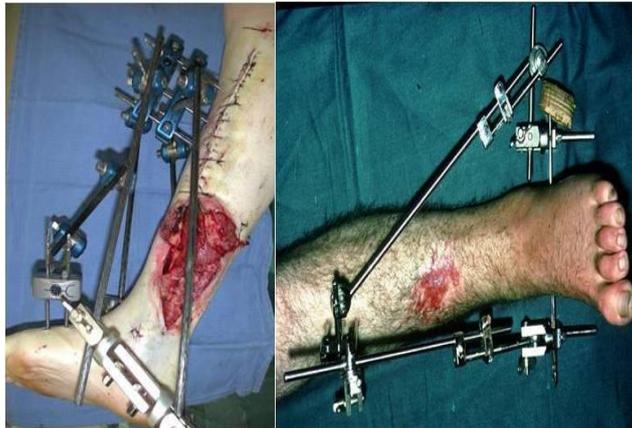
- The best treatment for mid shaft tibia fracture is Intramedullary (IM) Nailing But the most complication is anterior knee pain!!



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



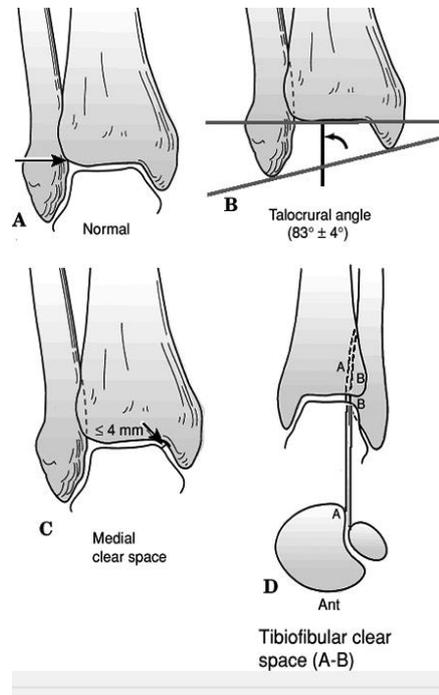
Lateral view:

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



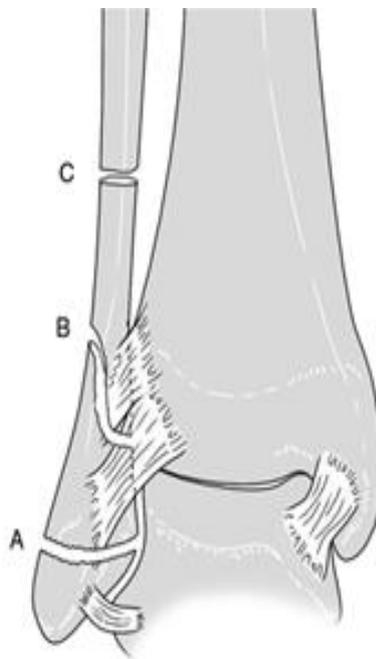
Mortise view:

- 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 مهجه

Treatment:

1- Stable weber B fracture (BKC)



2-Bimalleolar fracture need ORIF



Displaced MM fracture --ORIF



Tri malleolar fracture --ORIF



X-ray showed

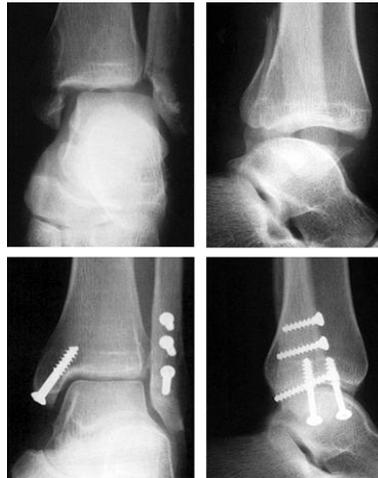
Bimalleolar ankle fracture with talarsubluxation and tilting

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