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: **" common 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, 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)

Pt present wit pain , swelling
If the fracture is grossly displaced the swelling will be obvious

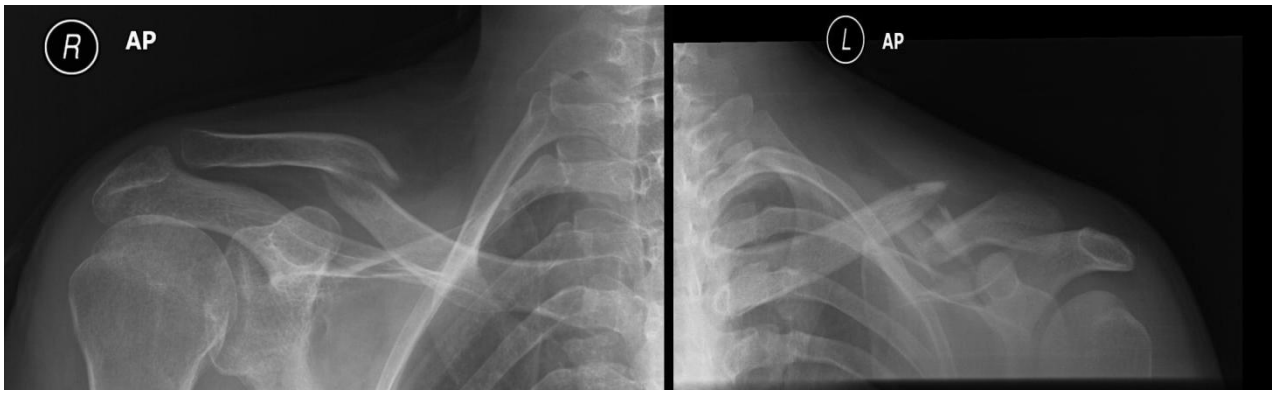
Clinical Evaluation:

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

RADIOGRAPHIC EVALUATION:

- anterior-posterior radiographs
- you can see comminuted fracture

Spiral fracture that means the MO fracture is indirect

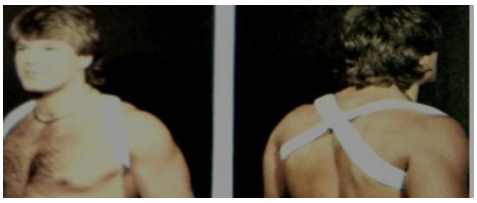


Clinical Features:

- 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**

N - Non Union
O - Open Fracture
C - Neurovascular Compromise Nonunion
A - Intra -articular Fracture

S - Salter- Harris 3, 4, 5

T - Poly Trauma

Complications:

Neurovascular compromise
Malunion

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

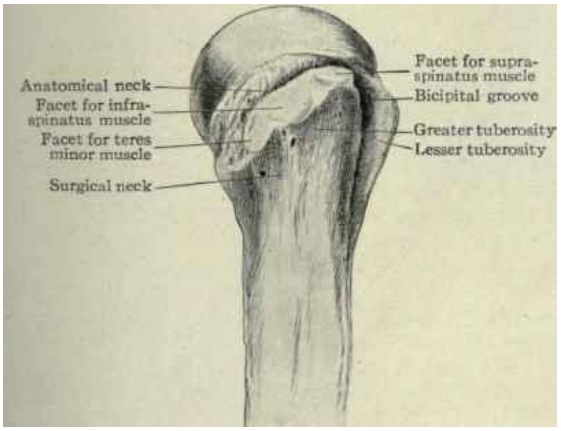
Post-traumatic arthritis at Laterally AC joint , medially SC joint.

Plate and screws

B- Humerus Fractures:

1- Proximal Humerus Fracture:

- Includes surgical and anatomical neck.
- 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 – abduct the shoulder

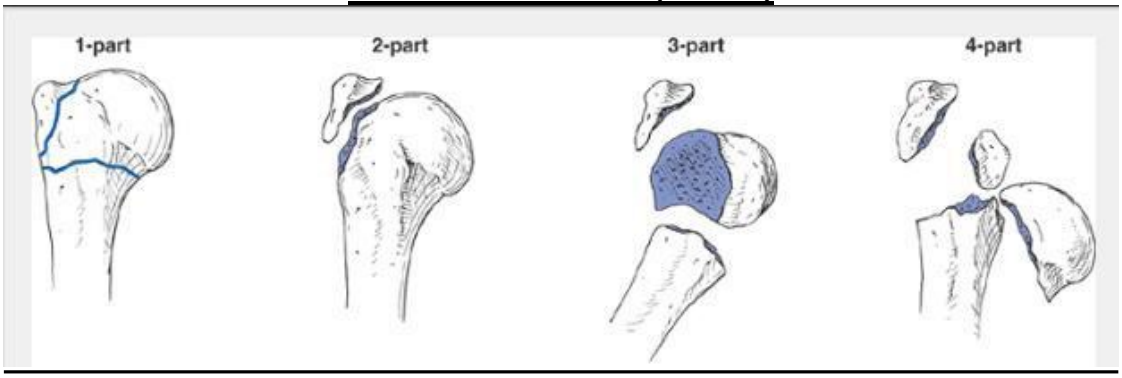
Sensory: to deltoid Muscle- lateral aspect

RADIOGRAPHIC EVALUATION:

- AP and lateral views
- Computed tomography: To evaluate for articular involvements and Fracture Displacement.
- Magnetic resonance imaging to assist the soft tissue

CLASSIFICATION (Neer's)

The worse the fracture ,the more (high) incidence of AVN



- **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,

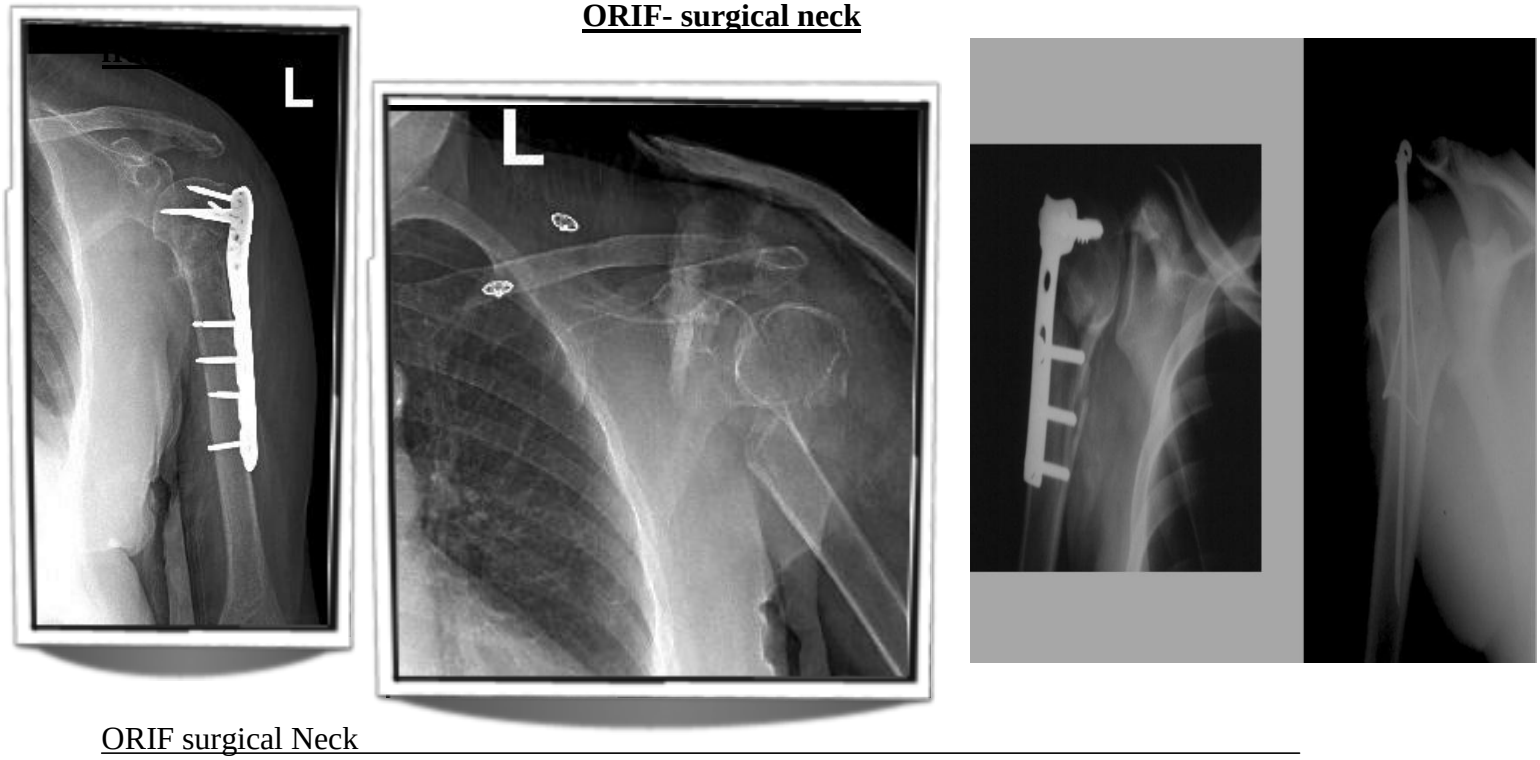
- **Two-part Fracture:** Any of the 4 parts with 1 displaced
- **Three part Fracture:** Displaced fracture of the surgical Neck + displaced greater tuberosity or lesser tuberosity.
- **Four- part Fracture:** Displaced fracture of Surgical Neck + both Tuberosities.

TREATMENT:

- 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.

- 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



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 rule out clinically by breath sound and auscultation and radiological by X-ray
- Myositis ossificans " calcification within the ms will decrease ROM , pain"
- Shoulder stiffness
- Osteonecrosis: " the worst complication " 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 – more soft tissue injury
- Direct injuries results in transverse or comminuted fracture
- May be associated with Radial Nerve injury (AT THE SPIRL GROOVE OF THE HUMERUS)

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

Some pt present with radial N palsy " wrist drop" unable to dorsiflex the rest .

RADIOGRAPHIC EVALUATION:

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

Dorsal aspect of the hand in the web space "loss of sensation "

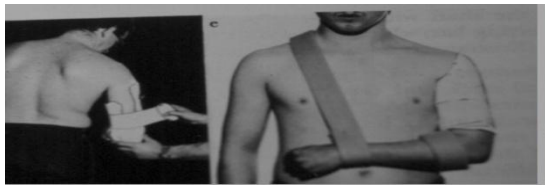
CLASSIFICATION (Descriptive):

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

Radial injury common with comminuted F

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 varus angulation 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
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.

When we use K –wires we should use cast to cause more stability

- Complications include pin tract infection, neurovascular injury, and nonunion.


1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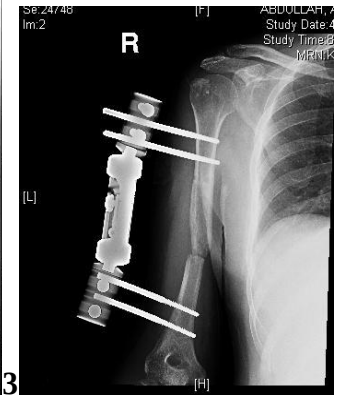

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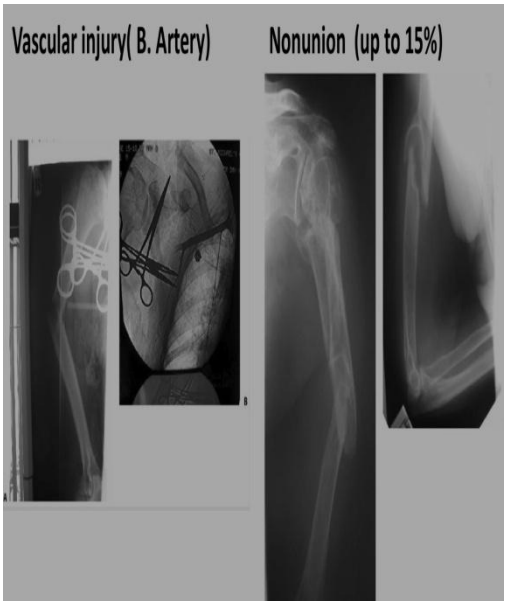


COMPLICATIONS

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

Fracture humerus in up to 12% of fractures

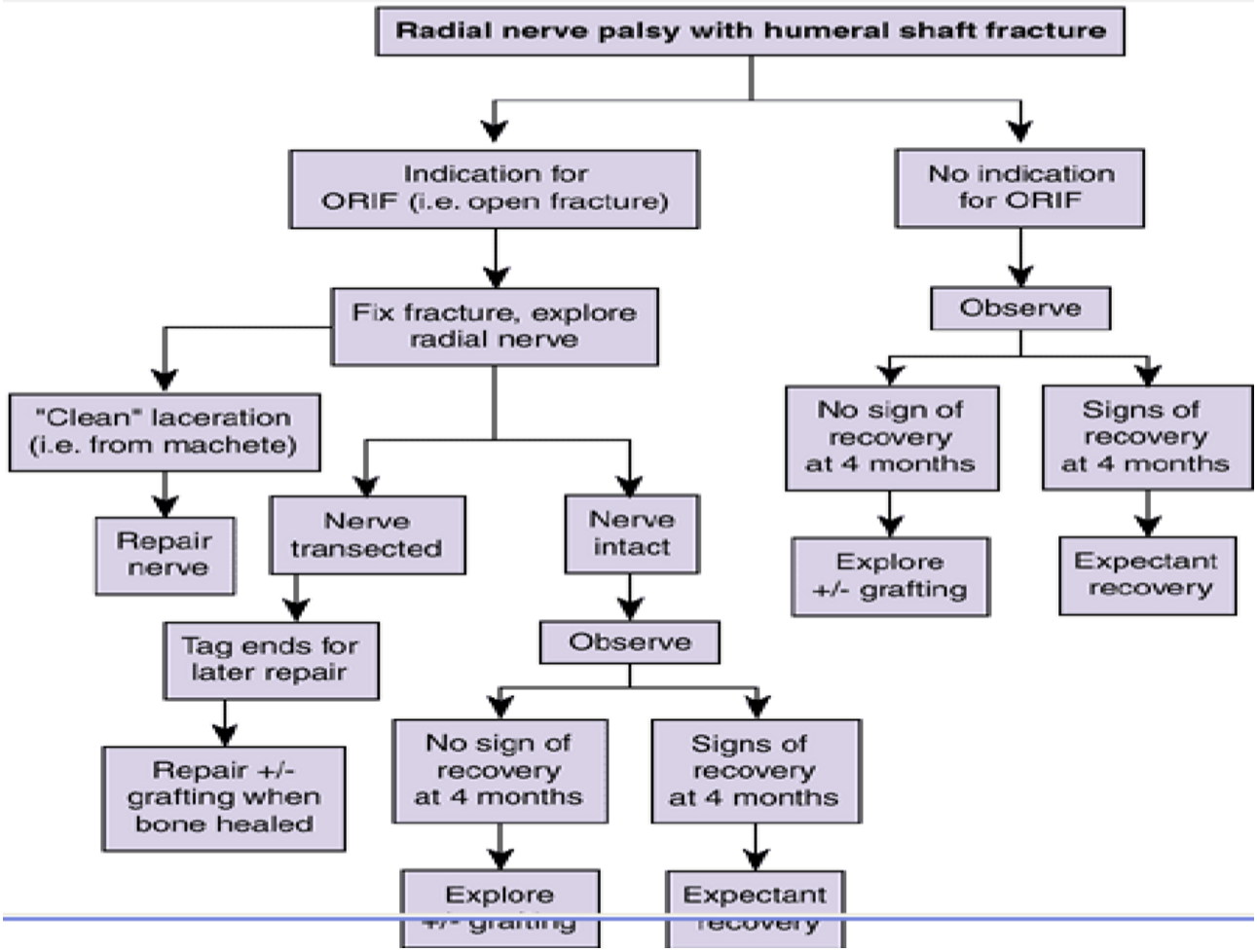
a. 2/3 (8%) of Radial injury are Neuropraxia. Most -the axion intact with nerve compression

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

Radiographic Evaluation:

Anteroposterior (AP) and lateral views

Radiographic evaluation should include the two joints.

Radius and ulna in the same level

Classification (Descriptive):

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

Treatment:

- 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.

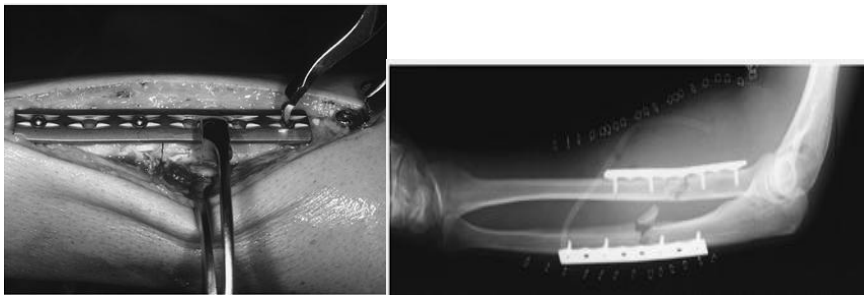
1- Operation:

A. Open reduction and internal fixation

B. External fixation

Indication

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



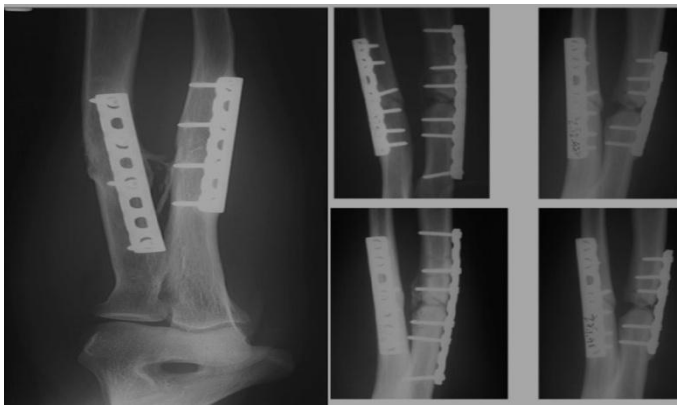
Complications:
A. Nonunion and malunion

b. Infection:

c. Neurovascular injury

d. Volkman ischemia follows Compartment Syndrome.

e. Posttraumatic radioulnarsynostosis (3% to 9%)



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

If the fracture displace we should check the skin if intact or not b/c of high risk of open fracture

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%).

RADIOGRAPHIC EVALUATION:

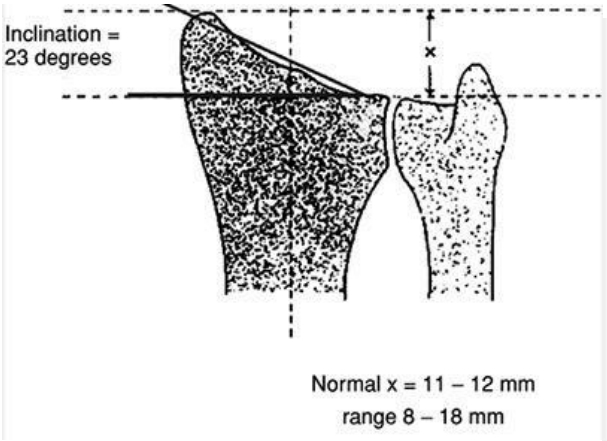
Posteroanterior and lateral views

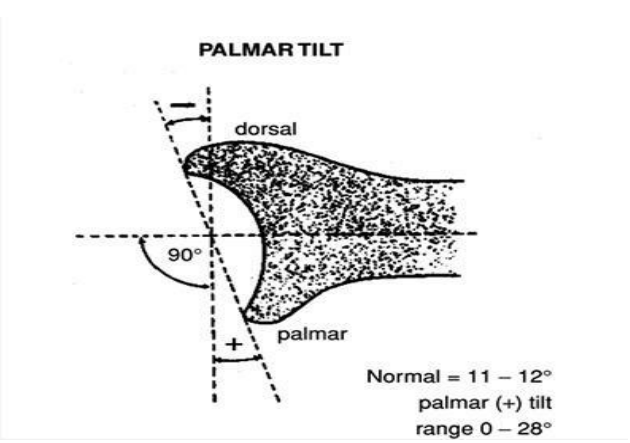
Normal radiographic relationships

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

b. Radial length: averages 11 mm (range, 8 to 18 mm).

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

Barton fracture: intraarticular fractures.

• 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.

Smith fracture (reverse Colles fracture):

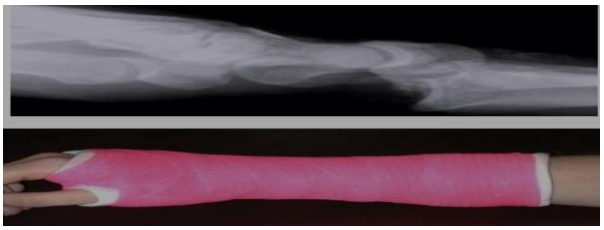
- A volar angulation (apex dorsal) of the distal radius with an garden spades deformity or volar displacement of the hand and distal radius ----ORIF
- Mechanism: a fall onto a flexed wrist with the forearm fixed in supination

TREATMENT

- Acceptable radiographic parameters for a healed radius in an active, healthy patient include:
  - 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.

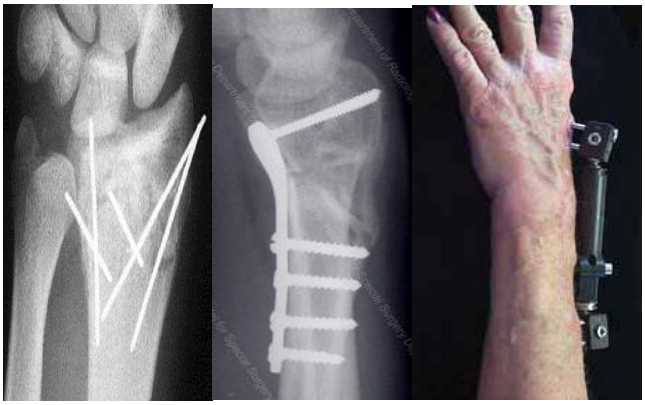
Normal

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



- High-energy injury
- Secondary loss of reduction
- Articular comminution, step-off, or gap > 2 mm
- Metaphysealcomminution or bone loss " unstable"
- Loss of volar buttress with displacement
- DRUJ incongruity "distal radioulnar joint"

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 with K- wires
- Midcarpal instability
- Posttraumatic osteoarthritis
- Finger, wrist, and elbow stiffness

Done 1/2!

Part 2: Lower Limb Fractures " pelvic ,hip ,femoral .tibia ,ankle"

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 in high energy trauma

1- Pelvic fractures: in ER we use a towel to prevent the expand hematoma or external fixation

- Classifications. (Tile)

Type A. Stable – bed rest and analgesia

Type B. Rotationally Unstable, Vertically Stable plate ,screw. External fixation .

Type C. Rotationally and Vertically Unstable. Need to close anterior ,posterior

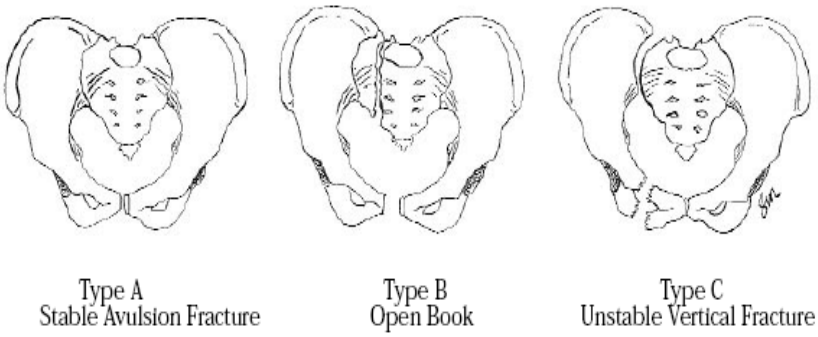


Figure 20. Illustration of the Tile Classification of Pelvis Fractures

So, **Type A**
Type A stable Fracture of superior & inferior pubic remi & no diasthesis of SP (Symphesis Pubis) - in the pic there is a gap that means

there is injury to the joint

Type B
Type B open book fracture Diasthesis of SP more than 2cm

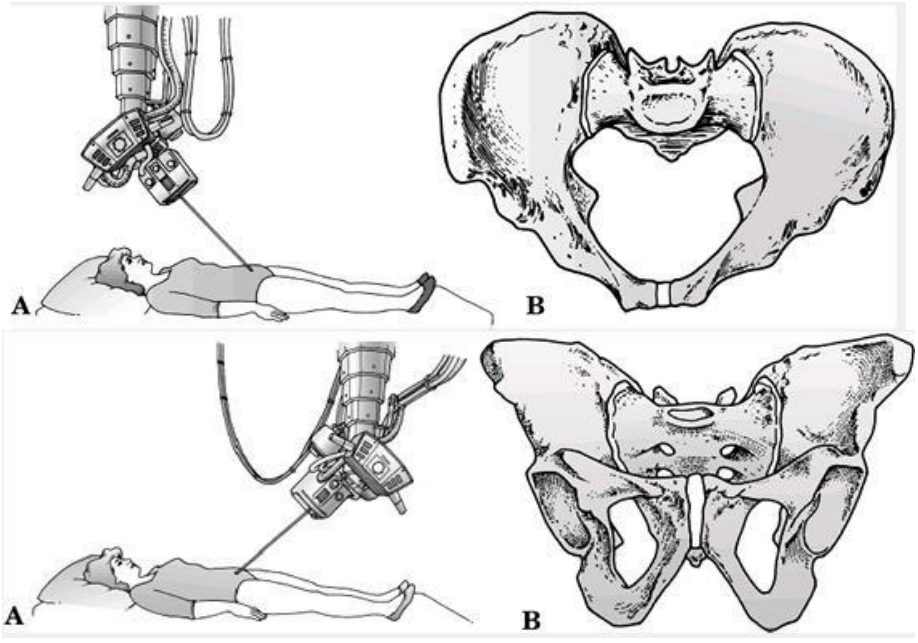
Type C
Type c fracture there is diasethsis of SP & vertical shear & SIJ (Sacro iliac joint) involvement

Radiological examination:

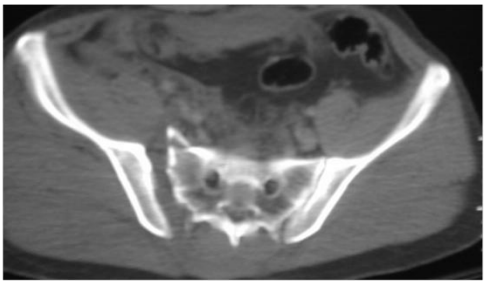
Q: which one is the normal AP?

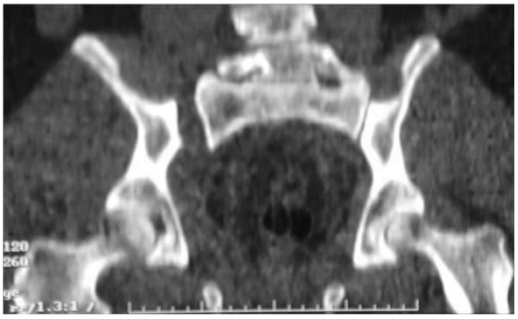
RADIOGRAPHIC EVALUATION:

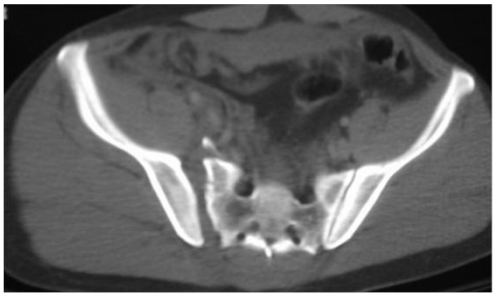
- AP of the pelvis
- Inlet radiograph
- Outlet radiograph
- Computed tomography
- Magnetic resonance imaging for any Soft tissue Injury.



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

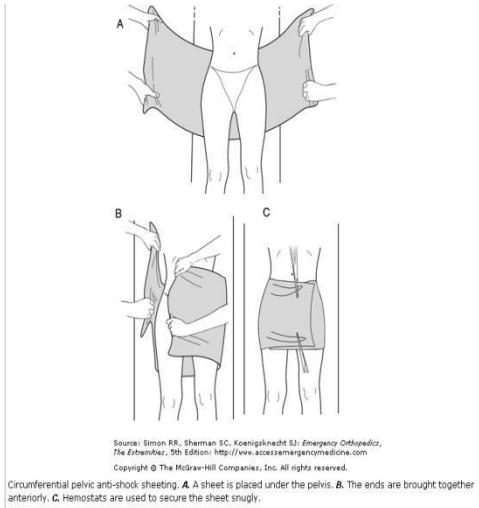
Type A. Bed rest& symptomatic treatment

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

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

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** (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.



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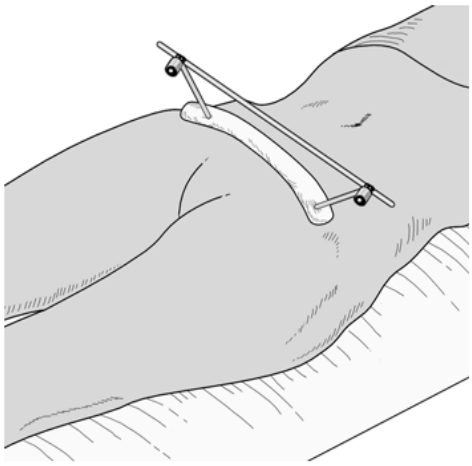
Circumferential pelvic anti-shock sheeting. *A.* A sheet is placed under the pelvis. *B.* The ends are brought together anteriorly. *C.* Hemostats are used to secure the sheet snugly.

- **external fixation**



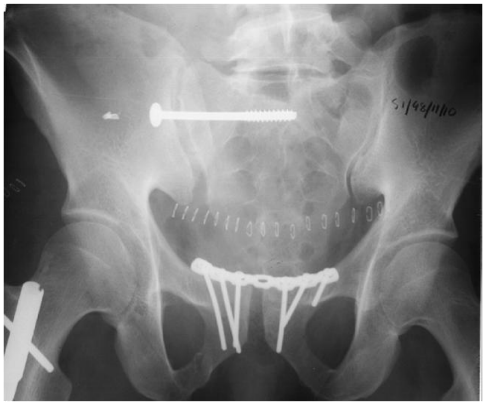
Source: Simon RR, Sherman SC, Koenigsknecht SJ: *Emergency Orthopedics, The Extremities*, 5th Edition: http://www.accessemergencymedicine.com

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 percutanous screw & plating of SP anterior (ORIF)



Complications

- Infection up to 25%
- Thromboembolism
- Malunion
- Nonunion
- Hemorrhage –life threatening –hypovolemic shock – most common cause of death
- Bladder (15%)/bowel injuries
- Neurological damage (L5-S1)
- Obstetrical difficulties
- Persistent sacro-iliac joint pain

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

Antalgic gate: the stance gate will be shorter b/c of the pain

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
I	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

AVN –depend on the degree of displacement.

Remember the supply to the femoral Head? 3 arteries!

Any fracture affecting the blood supply will cause AVN

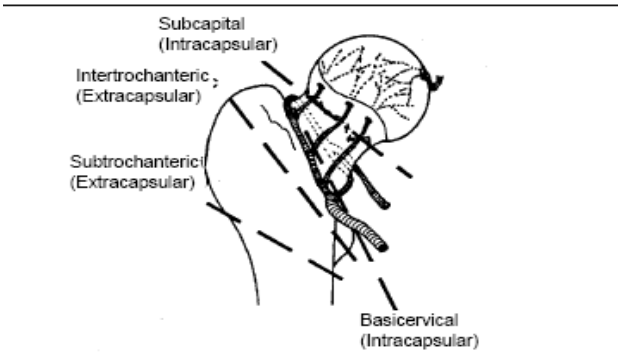
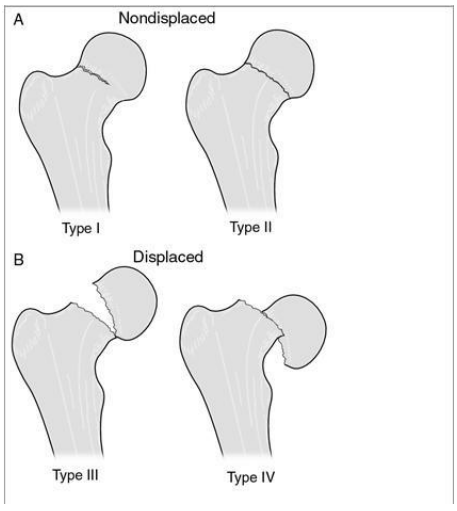
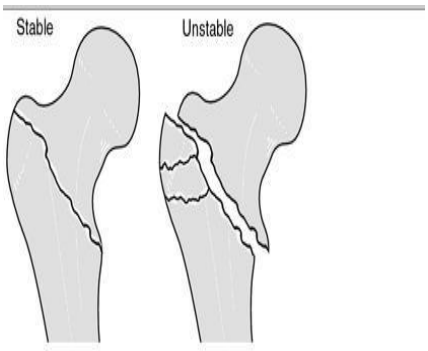


Figure 21. Blood Supply to Femoral Head and Fracture Classification





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

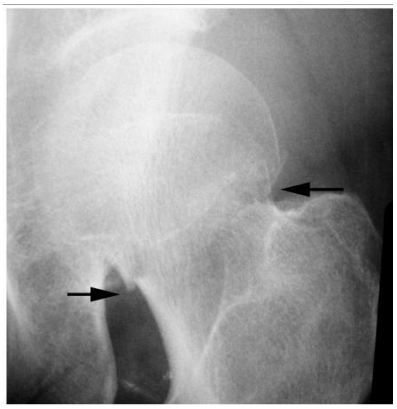
Treatment

- ❑ ORIF (sliding hip screw) to preserve femoral head

Clinical picture

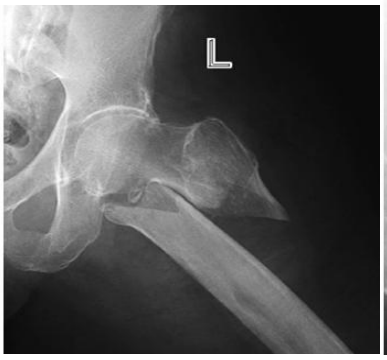
Pain
swelling
decrease ROM

AP



Type 2

High risk of AVN



Treatment:

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

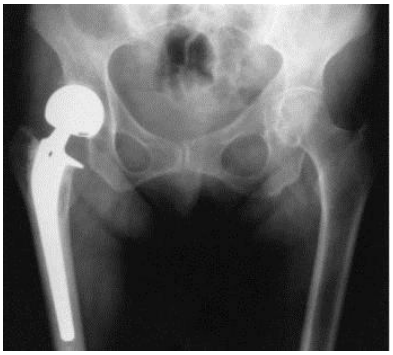
Treatment neck of femur

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.
(dynamic hip screw)

Age > than 65 years look for.
. Level of activities.
. Status of the acetabulum.
Then chose THR (if acetabulum is disease " ex: OA,fracture!) vs. hemi arthoplasty if the diseased acetabulum is not replaced will cause pain .



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

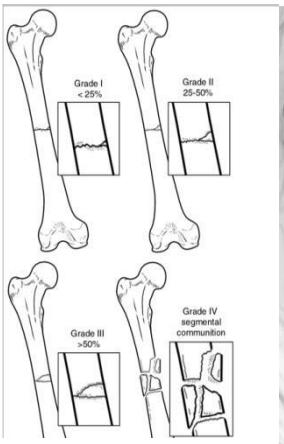
Clinical

- ❑ 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

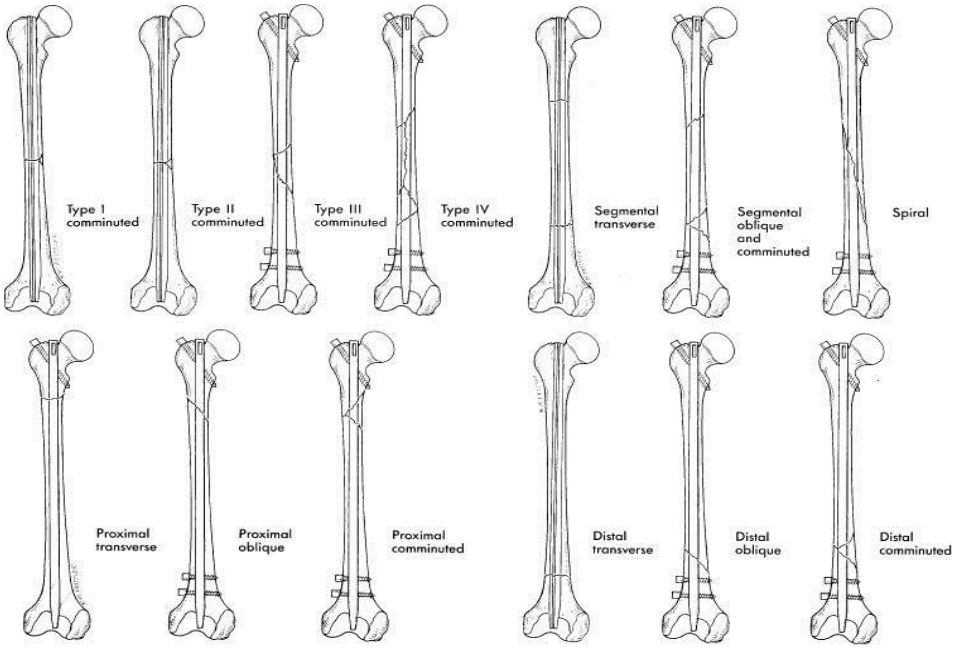
Treatment

- ❑ 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

This pt unable to move



The best treatment of is I.M.N



Mid shaft femur fracture, Intramedullary femoral nail (best Treatment)

Open reduction and plate fixation for femur fracture

If the fracture near to the joint we use plate

- **Not a Wight Bearing**

4- Tibia shaft fracture:

TIBIAL DIAPHYSIS FRACTURE

Tibia is covered by ms in the posterior aspect but in the anterior there is skin and soft tissue

- ❑ 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

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 fracutre

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

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

The rule of :
AP : translocation
Rotation

L : angulations'

R/o and start treatment for open

Open fracture :
In the ER :
Realignment
Analgesia
Antibiotic
Back slap
To prevent extend and minimize the pain
Obtain X ray

OR :
No gross contamination
Wash wound by NS
Swab culture
Type if fixation

Radiological study

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

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

(1) (2)

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 appostion>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

If cast will be more than 6 mon
We will use Intramedullary (IM) Nailing

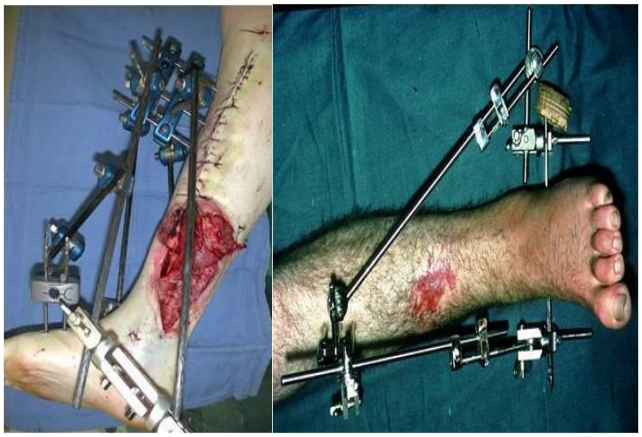
- Operative treatment:

- 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!

- 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) - suspicion of dislocation if there is gross deformity "

RADIOGRAPHIC EVALUATION

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

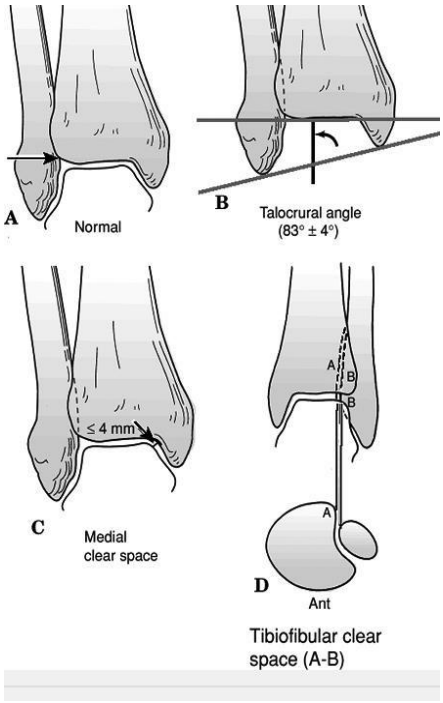
- Tibiofibula overlap of <10 mm is abnormal and implies syndesmotic injury.
- Tibiofibula clear space of >5 mm is abnormal and implies syndesmotic injury
- Talar tilt-

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

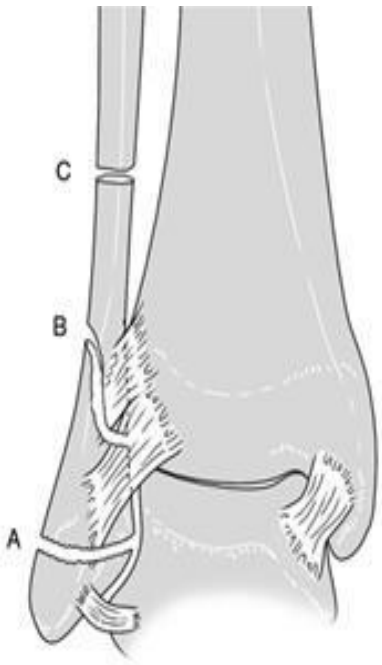
Mortise view:

- 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

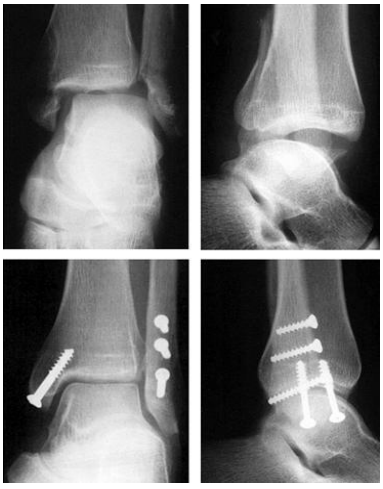
Unstable

Displaced MM fracture --ORIF

Tri malleolar fracture --ORIF

X-ray showed

Bimalleolar ankle fracture with talarsublaxation and tilting



Treatment

ORIF

O R T H O P E D I C S 4 2 9 T E A M

Group A1

Bimalleolar fracture --- Percuteneous screw fixation

Complications:

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

Upper :
Any fracture in the diaphysis – surgical with plate and screw or intramedullary

Lower :
Intramedullary nails
If the fracture near to the joint use plate and screw

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!