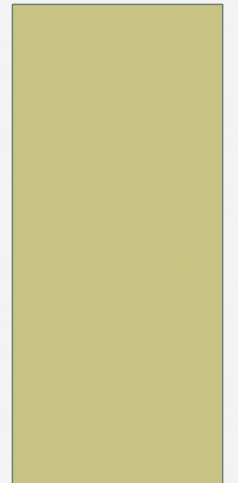


LOWER LIMB FRACTURES

PART 1

HIP FRACTURES

DONE BY : SALLY SAKET



# INJURIES OF THE PELVIS

- Fractures of the pelvis account for less than 5 per cent of all skeletal injuries .
- About **two-thirds** of all pelvic fractures occur in road accidents involving pedestrians >> Pelvic ring fractures and injuries are more often verified among males.
- over **10 per cent** of these patients will have associated visceral injuries

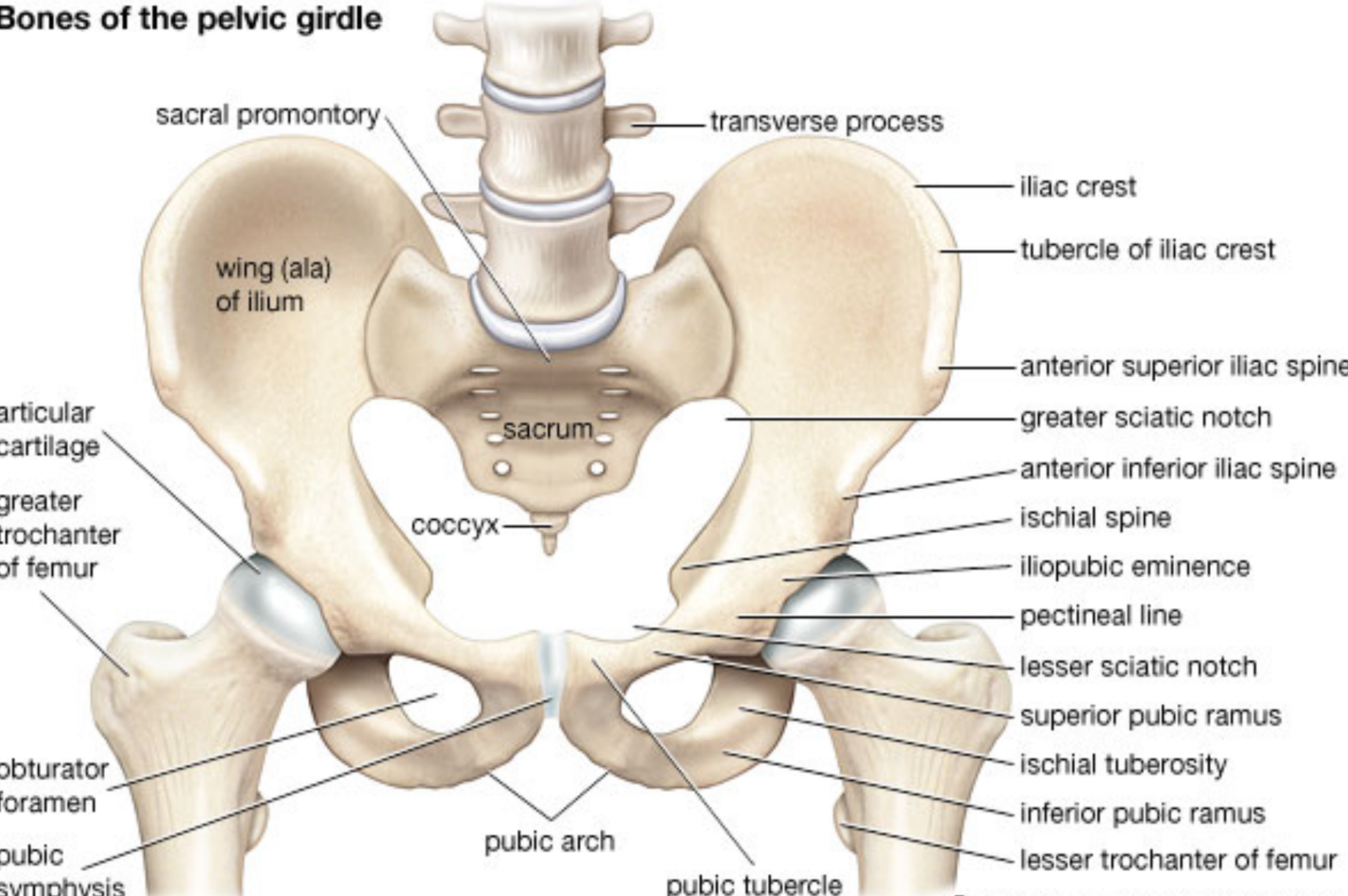
# PELVIC FRACTURE

- ? For pelvic to be fractured it has to be high energy trauma .
- ? Fractures of the pelvis are particularly serious ? Why ?

Because they are often complicated by damage to the pelvic soft tissues (bowel, bladder, urethra, reproductive organs, nerve plexuses, and a network of supporting ligaments), causing massive blood loss which can be fatal.

The overall mortality in pelvic trauma is **9%**, although this is significantly increased (up to **50%**) if the patient is hemodynamically unstable .

# Bones of the pelvic girdle



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# TYPES OF INJURY

Injuries of the pelvis fall into three groups:

(1) Isolated Fractures with an **intact pelvic ring** (outside the pelvic ring) .

(2) Fractures **of the Pelvic Ring** ( **Single , double** ) .

(3) Lateral wall fracture ( fractures of the **acetabulum** ) .

# 1) ISOLATED PELVIC FRACTURES

MANAGEMENT >> REST AND ANALGESIA FOR 3 W

a. Avulsion fractures ( at insertion

or origins points of muscles )

b. Direct fractures ( to iliac wing ,

sacrum , coccyx )

c. Stress fractures

*\* falling on  
an outstretched  
hand and causing tibial fracture  
in inclined? → fracture in the cluncho*

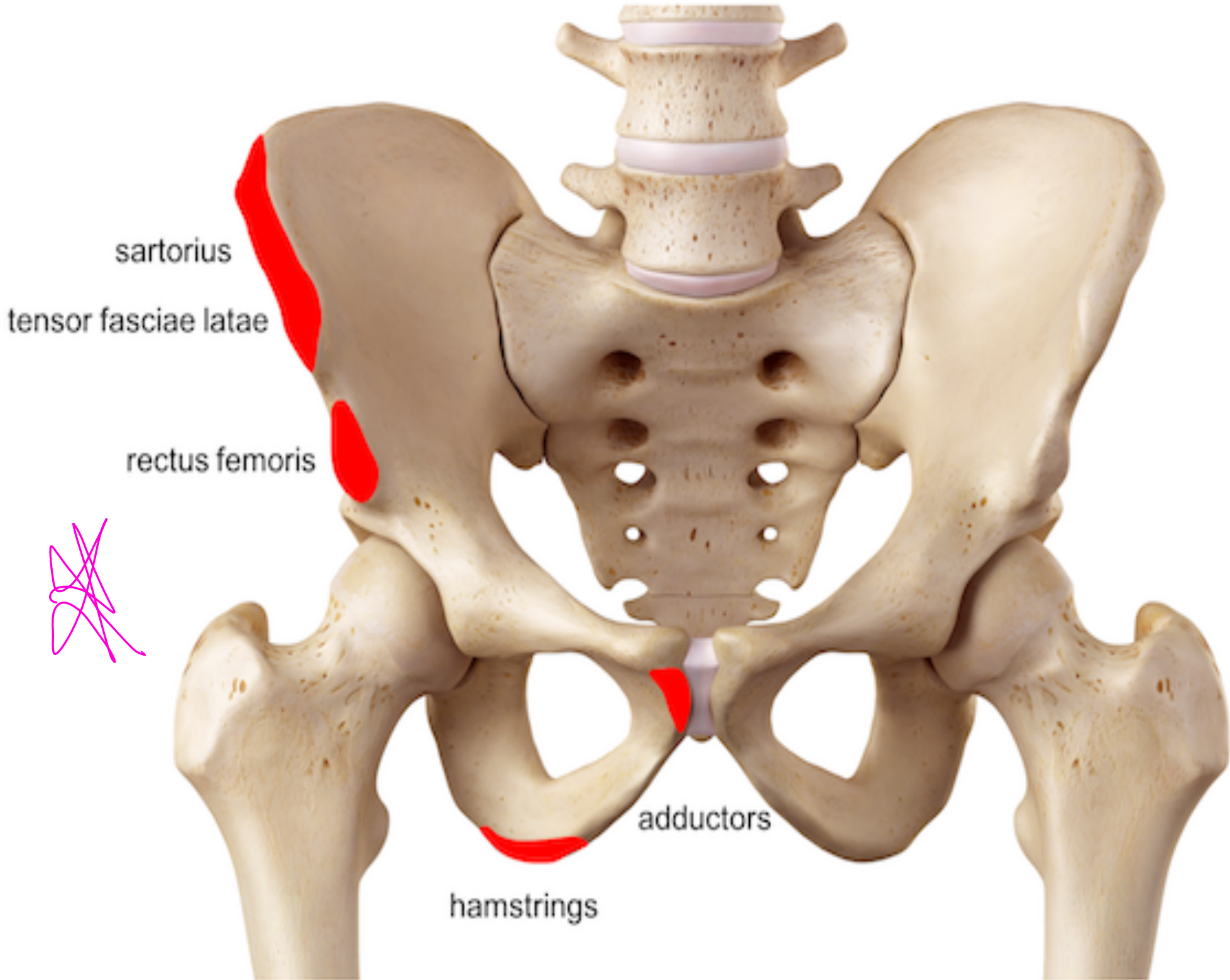
# A. AVULSION FRACTURES



? **A piece of bone is pulled off by violent muscle contraction** ; this is usually seen in athletes.

1. The **Sartorius** may pull off the anterior superior iliac Spine
2. **rectus femoris** - the anterior inferior iliac spine
3. **adductor longus** - a piece of the pubis
4. **hamstrings**- part of the ischial tuberosity .

All essentially muscle injury , needing only rest for a few days and reassurance .





## B. DIRECT FRACTURES

**A direct blow to the pelvis**

usually after a **fall from a height**

may fracture the ischium or the iliac wing or coccyx .

## C. STRESS FRACTURES

1. Fractures of the pubic rami are fairly **common** (and often quite **painless**) in severe cases. >>  
osteoporotic or osteomalacic patients.
2. around the sacroiliac joints; this is an **uncommon** cause of '**sacroiliac**' pain in >> elderly osteoporotic individuals and long distance runners.

## 2) Fractures of the Pelvic Ring

### Stable ring injuries

- 1) *The patient is not severely shocked*
- 2) pain on attempting to walk.
- 3) localized tenderness but seldom any damage to pelvic viscera.
- 4) Plain x-rays reveal the fractures.

### Unstable ring injuries

- 1) *The patient is severely shocked* ✖
- 2) great pain and unable to stand.
- 3) unable to pass urine
- 4) there may be blood at the external meatus.
- 5) Tenderness is widespread,
- 6) attempting to move one or both blades of the ileum is very painful.

✖ Case of Death  
Bleeding

# THE BASIC MECHANISMS OF PELVIC RING INJURY :

1. *Anteroposterior compression - APC .*
2. *Lateral compression - LC.*
3. *Vertical shear ( falls from a height onto one leg ).*
4. *Combination injuries .*

# 1. ANTEROPOSTERIOR COMPRESSION (APC)

This injury is usually caused by a frontal collision between a pedestrian and a car.

1. The **pubic rami are fractured** or
2. the **innominate bones are sprung apart and externally rotated**, with disruption of the symphysis – the so-called **'open book'** injury.

? This fracture pattern increases the pelvic volume and is associated with the largest amount of blood loss.

→ venous plexus bleeding

# YOUNG AND BURGESS CLASSIFICATION

**LC: anterior injury = rami fractures**

LC I: sacral fracture on side of impact

LC II: crescent fracture on side of impact

LC III: type I or II injury on side of impact with contralateral open book injury

**AP compression (APC): anterior injury = symphysis diastasis/rami fractures**

APC I: minor opening of symphysis and SI joint anteriorly

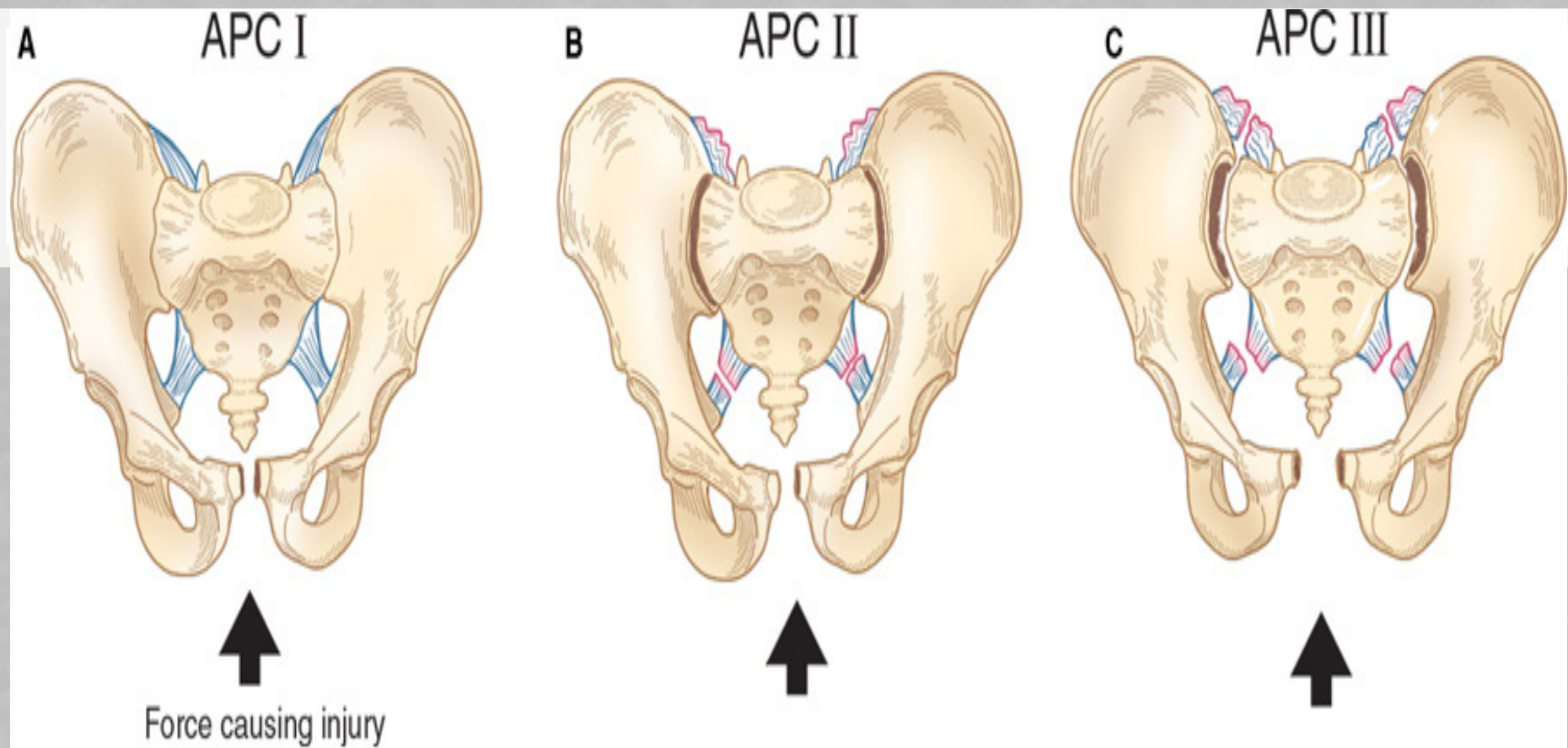
APC II: opening of anterior SI, intact posterior SI ligaments

APC III: complete disruption of SI joint

**Vertical shear (VS) type:**

Vertical displacement of hemi pelvis with symphysis diastases or rami fractures anteriorly, iliac wing, sacral fracture, or SI dislocation posteriorly

**Combined mechanism (CM) type: any combination of above injuries**



Source: Simon RR, Sherman SC: *Emergency Orthopedics, 6th Edition*:  
[www.accessemergencymedicine.com](http://www.accessemergencymedicine.com)

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### Anterior Posterior Compression (APC)

APC I	Symphysis widening < 2.5 cm
APC II	Symphysis widening > 2.5 cm. Anterior SI joint diastasis ??. Posterior SI ligaments intact. Disruption of sacrospinous and sacrotuberous ligaments. ?
APC III	Disruption of anterior and posterior SI ligaments (SI dislocation). Disruption of sacrospinous and sacrotuberous ligaments. APCIII associated with vascular injury ??

## 2. LATERAL COMPRESSION (LC)

Side-to-side compression of the pelvis causes the ring to buckle and break >> due to a side-on impact in a road accident or a fall from a height.

**Anteriorly the pubic rami on one or both sides are fractured**

**+**

**posteriorly there is**

1. a severe sacroiliac strain or
2. a fracture of the sacrum or ilium

**\*\* either on the same side as the fractured pubic rami or on the opposite side of the pelvis. ( ipsilateral or contralateral )**



# YOUNG AND BURGESS CLASSIFICATION

**LC: anterior injury = rami fractures**

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LC II: crescent fracture on side of impact

LC III: type I or II injury on side of impact with contralateral open book injury

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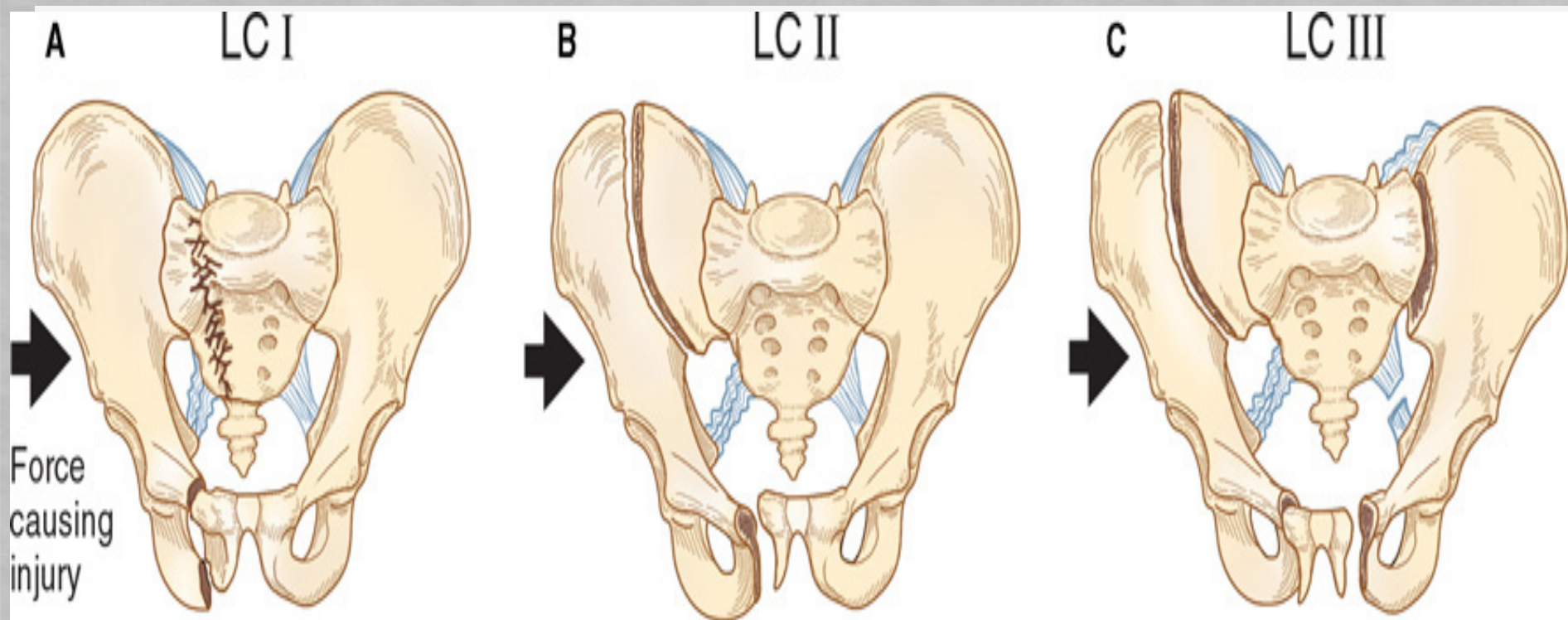
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### Lateral Compression (LC)

LC I	Oblique or transverse ramus fracture and ipsilateral anterior sacral ala compression fracture.
LC II	Rami fracture and ipsilateral posterior ilium fracture dislocation (crescent fracture). ?
LC III	Ipsilateral lateral compression and contralateral APC (windswept pelvis). ? Common mechanism is rollover vehicle accident or pedestrian vs auto.

### 3. FALLS FROM A HEIGHT ONTO ONE LEG

-Will result in fracture called >> ***Vertical shear (VS)*** :

The innominate bone **on one side** is displaced **vertically**  
= ( fracturing the pubic rami and disrupting the sacroiliac region on the same side).

These are usually **severe, unstable** injuries with gross tearing of the soft tissues and **retroperitoneal haemorrhage**.

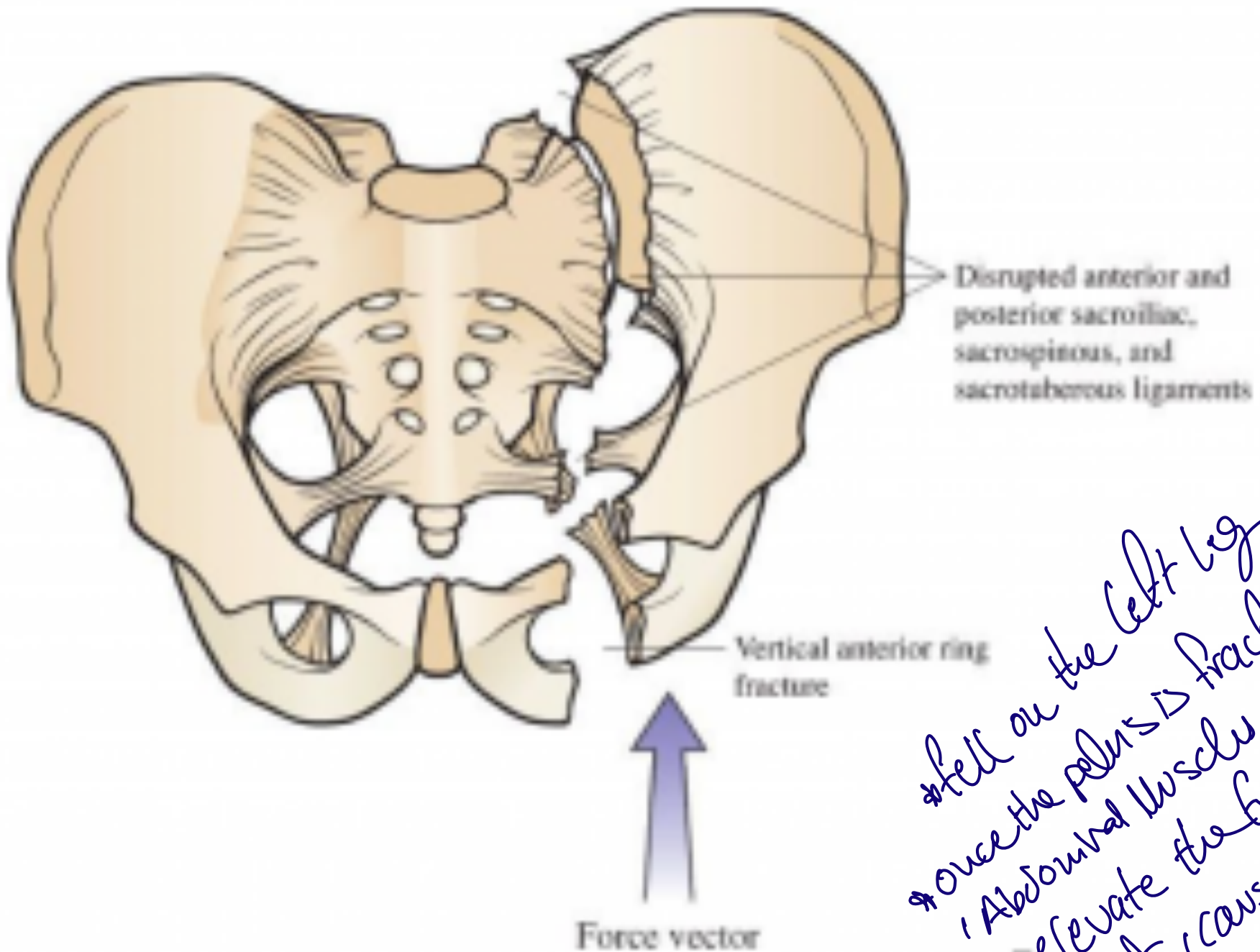


Figure 6. Vertical Shear Fracture<sup>6</sup>

*\*fell on the left leg  
 \*over the pelvis is fractured  
 \*Abdominal muscles will  
 elevate the fractured  
 part, causing its  
 displacement*

## Double fracture of the pelvic ring

### 1. Combined breaks in both anterior and posterior segments of the pelvic ring :

Items	Vertical shear fracture	Hinge subluxation
<b>Consist of</b>	Fractures of both rami or disruption of the symphysis pubis at the front and fracture of the ileum or sacrum or a disruption of the sacroiliac joint posteriorly.	Disruption of the symphysis pubis with wide separation in addition to disruption of one sacroiliac joint with little separation (open-book injury).
<b>Displacement</b>	The mobile hemipelvis tends to be pulled upwards by the anterior and posterior trunk muscles. It also opens up like a book by the weight of the leg.	The stability of this injury is variable.
<b>Prognosis</b>	This type of pelvic fracture is associated with the highest mortality and morbidity.	Variable.

### 2. Double breaks in the anterior segment of the pelvic ring :

Fractures of the pubic rami on both sides (**Tetraramic fractures**), the detached segment may be displaced backwards. The urethra is often sheared off at the apex of the prostate in a male.

Vertical shear



Hinge subluxation



Fig (27)

Tetra-ramic



Displaced  
Goes in to the organ

# TILE CLASSIFICATION

## Type A: Pelvic Ring Stable

A1: fractures not involving the ring (i.e., avulsions, iliac wing, or crest fractures)

A2: stable minimally displaced fractures of the pelvic ring

## Type B: Pelvic Ring Rotationally Unstable, Vertically Stable

B1: open book

B2: lateral compression, ipsilateral

B3: lateral compression, contralateral, or bucket-handle-type injury

## Type C: Pelvic Ring Rotationally and Vertically Unstable:

C1: unilateral

C2: bilateral

C3: associated with acetabular fracture

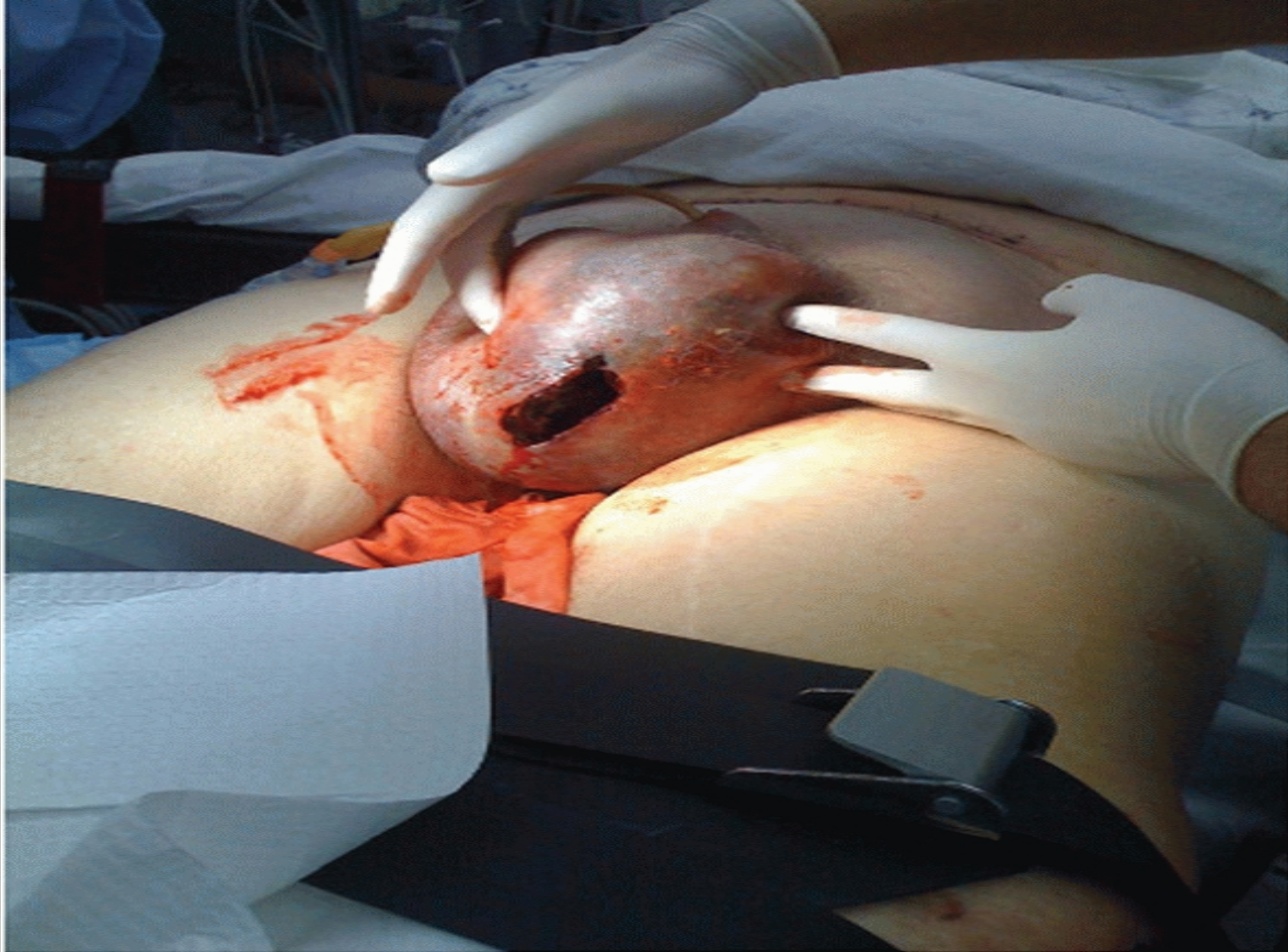
# CLINICAL ASSESSMENT

\*\* NOTE: A fracture of the pelvis should be suspected in every patient with serious abdominal or lower limb injuries.

- **Signs clinically guide you that there is a pelvic fracture :**
  1. Blood at the tip of meatus >> suggests serious visceral damage
  2. Scrotal or labial swelling and perineum or sacral ecchymoses
  3. Hip dislocation >> the length of the 2 hip joint differ
  4. Open book fracture ( wide pelvis and the legs are externally rotated )
- ❓ The patient may be severely shocked (2.5 L) due to blood loss and visceral damage >> Resuscitation should be started even before the examination is complete
- ❓ In case 3 + 4 >>> should put the pelvic binder and correct the deformity



CLINICAL PHOTOGRAPH SHOWING SCROTAL  
ECCHYMOSIS AND HEMATOMA IN A PATIENT WITH  
A PELVIC FRACTURE.



5. During **rectal examination (which is mandatory)**, the coccyx and sacrum can be felt; more importantly, the position of the prostate can be changed: if it is abnormally high >> **it suggests a urethral injury.**

- **Abdominal tenderness and guarding** >> suggest intraperitoneal bleeding, possibly due to rupture of the spleen or liver.
- **A ruptured bladder** should be suspected in patients who do not void or in whom a bladder is not palpable after adequate intravenous fluid replacement.
- **Neurological examination** is **essential**. There may be damage to the lumbosacral plexus; a common presenting sign is **a foot-drop** as a result of damage to the L5 nerve root.

# IMAGING / X-RAY

? During the initial survey of every severely injured patient, a **plain anteroposterior x-ray of the pelvis** should be obtained at the same time as the chest x-ray.

>> In most cases this film will give sufficient information.

The films are often difficult to interpret and **CT scans are much the best way of visualizing the nature of the injury.**

# IMAGING / CT

- If any serious injury is suspected, a CT scan at the appropriate level is extremely helpful.
- This is particularly true for **posterior pelvic ring disruptions** and for **complex acetabular fractures**, which cannot be properly evaluated on plain x-rays.

# HEMORRHAGE

- ? Vascular disruption and hemorrhage are frequently associated with injuries to the pelvic ring and account for the majority of deaths directly related to the pelvic fracture.
- ? hemorrhage results most frequently (80%) from the **venous structures.**
- ? Pelvic **venous hemorrhage** stops in the majority of patients secondary to tamponade from increasing tissue pressure within the pelvic retroperitoneal space.

# MANAGEMENT

- Early management
- Treatment of fracture

MCQ → *سوال امتحان*  
cause of death is?  
venous bleeding

# ? EARLY MANAGEMENT :

1) DO ABCD

## 1. a pelvic compression binder applied

by the ambulance crew or paramedics attending the accident; this provides immediate stability to any pelvic ring disruption and is potentially lifesaving.

\* if not available  
use the cover of  
the bed

## 2. MANAGEMENT OF SEVERE BLEEDING

also sit for  
pelvic xray \*

## 3. MANAGEMENT OF THE URETHRA AND BLADDER

\* what 3 x-rays to do  
for Multi Injured patient?  
1. Cervical spine  
2. Chest  
3. Pelvis



# TREATMENT OF THE FRACTURES

? - Traditional treatments of **prolonged bed rest** and **traction** are avoided Why !!!

incidence of **pressure sores, venous thromboembolism and chest sepsis.**

>> **Stable fractures** are treated with **early mobilization,**  
and

>> the **principles of operative treatment** are **to convert**  
**an unstable pelvis to a stable pelvic** ring to allow  
mobilization.

It should be emphasized that **more than 60 per cent** **of**  
**pelvic fractures need no fixation .**

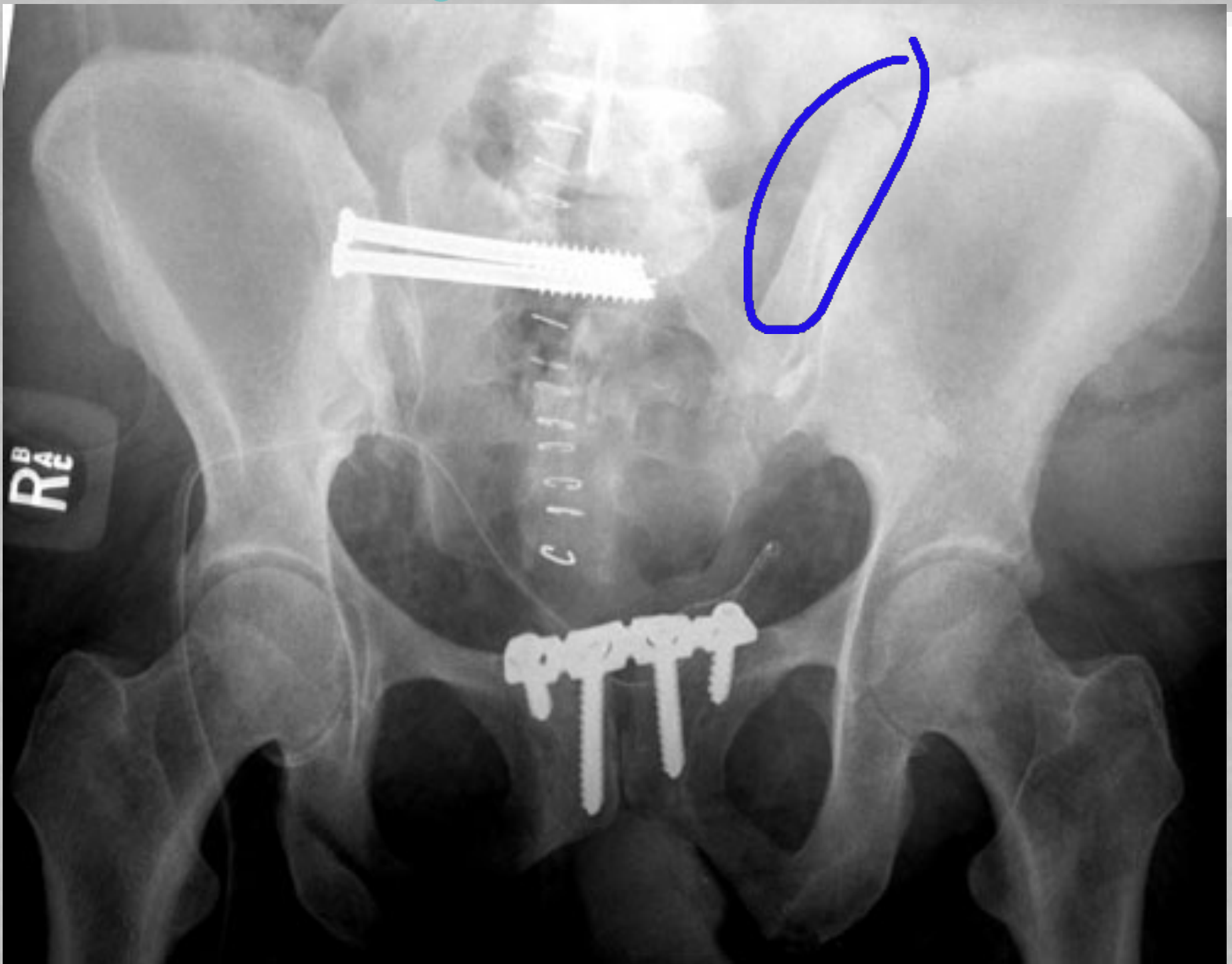
# 1. UNDISPLACED RING FRACTURES

- ❓ Include injuries involving a pubic ramus fracture anteriorly and an undisplaced sacral fracture posteriorly.
- ❓ Pain usually subsides after a few days, and patients can be mobilized partially weight bearing on the affected side  
>> So **rest + analgesia for 6 weeks**

## 2. ANTEROPOSTERIOR COMPRESSION INJURIES

- ? 'Open-book' injuries involve anterior symphysis pubis widening and posterior sacroiliac joint (SIJ) disruption.
- ? Anteriorly, a wide symphysis is treated by **open reduction and internal fixation**.
- ? posteriorly the SIJ injury is internally **fixed with percutaneous placement of iliosacral screws**.

\* The most common used fixation → External fixation



# 3. VERTICAL SHEAR FRACTURES AND DISPLACED LATERAL COMPRESSION FRACTURES

- The fracture or dislocation must be
  1. reduced >> Open or closed (traction)
  2. then stabilized >> Internal / External fixation

CLINICAL PHOTOGRAPH SHOWING AN ANTERIOR  
EXTERNAL FIXATOR PLACED LOW ENOUGH TO PROVIDE  
ACCESS TO THE ABDOMEN FOR LAPAROTOMY.



# COMPLICATIONS:

(1) thromboembolism

(2) sciatic nerve injury: It is essential to test for sciatic nerve function both before and after treating the pelvic fracture.

(3) Urogenital problems Urethral injuries sometimes result in **stricture, incontinence or Impotence** and may require further treatment.

(4) Persistent sacroiliac pain, **Unstable** pelvic fractures are often associated with partial or complete sacroiliac joint disruption, and this can lead to persistent pain at the back of the pelvis. Occasionally arthrodesis of the sacroiliac joint is needed.



# FRACTURES OF THE ACETABULUM

- Fractures of the acetabulum occur when the *head of the femur is driven into the pelvis.*
- This is caused either by a blow on the side (as in a fall from a height) or by a blow on the front of the knee, usually in a dashboard injury when the femur also may be fractured.

## 9.Hip

### *Dashboard Fracture –*

Fracture of the **posterior lip of acetabulum** often associated with **posterior dislocation** of hip.



## Lateral wall fractures

### 1. Acetabular fractures :

(a) Linear fractures.

(b) Comminuted fracture.

- They result in subluxation or central dislocation of the femoral head.

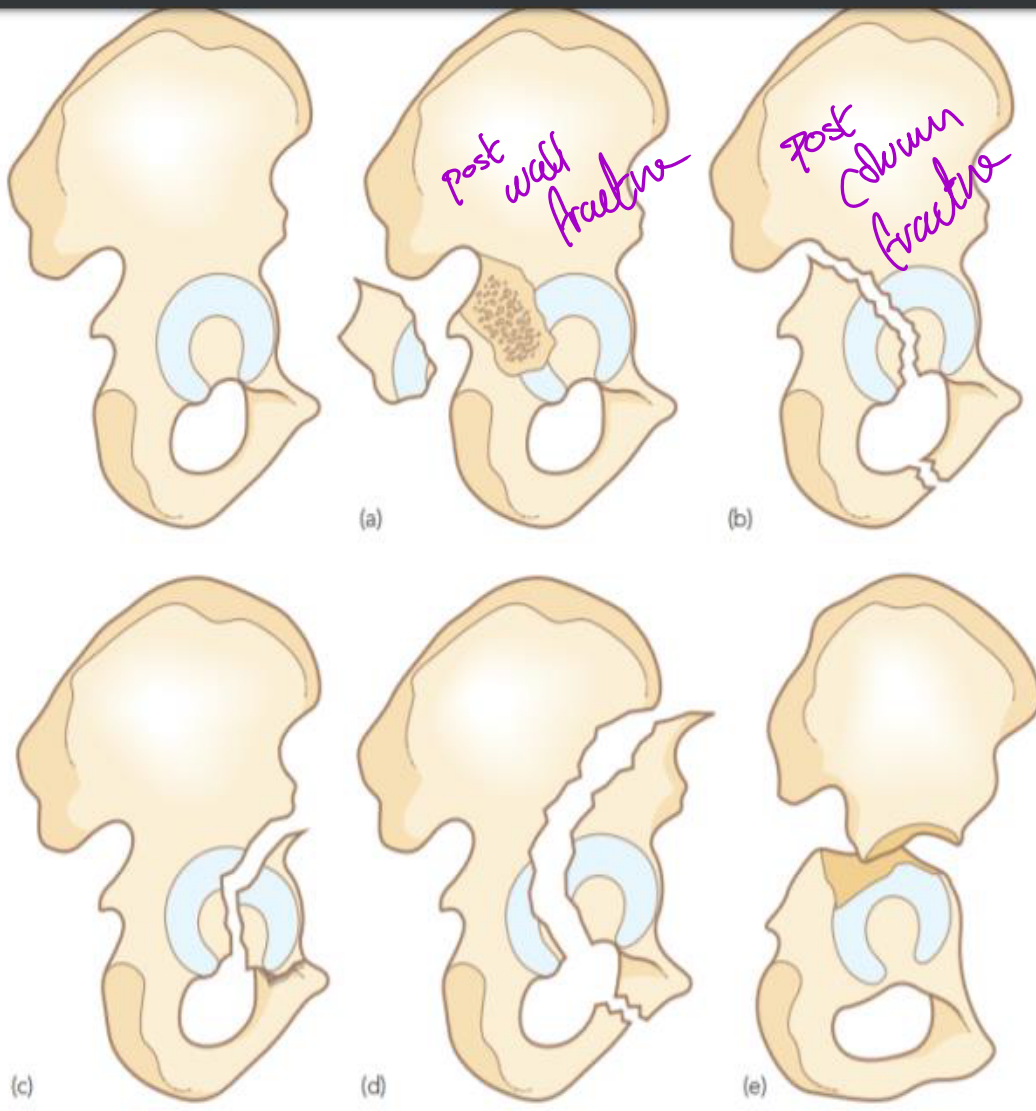
### 2. Segmental fracture :

- This occurs when segment of the lateral wall of the pelvis containing the intact acetabulum is displaced inwards.

④ Any intra-articular fracture even if 2mm  
Anatomical Reduction  
Back 100% by surgery  
Why? to prevent DOA

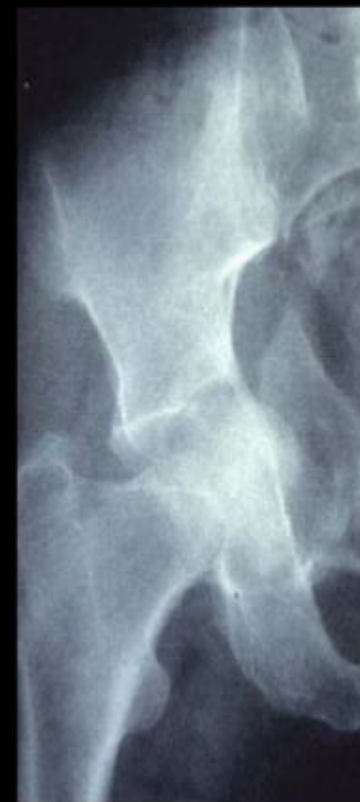
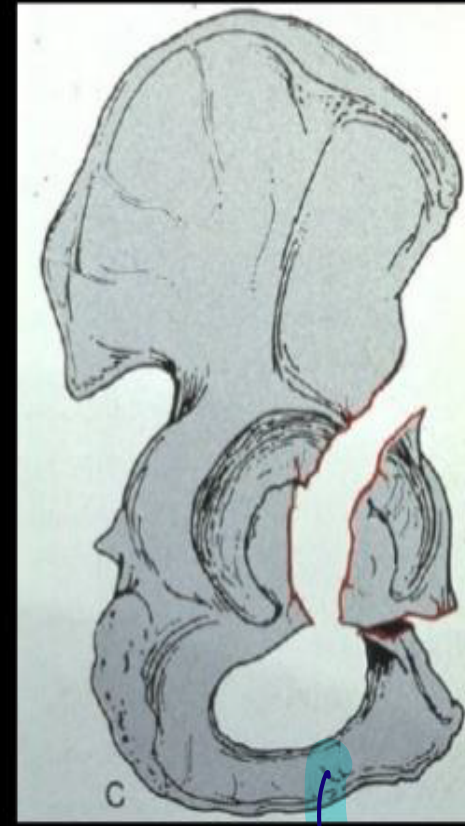
"a common complication of intra-articular fracture."

labeled wall fracture



**30.8 Fractures of the acetabulum** Shown here are drawings of the normal hemipelvis and the five main elements in Letournel's classification. (a) Posterior wall fracture. (b) Posterior column fracture. (c) Anterior wall fracture. (d) Anterior column fracture. (e) Transverse fracture.

# Anterior Wall Fracture



\* hook at iliopectineal line, if the head moves passing it → fracture Acetabulum

# CONSERVATIVE TRT

- **Undisplaced fractures** could be treated conservatively with minimal weight bearing and early mobilization
- - Close monitoring over the first 6 weeks is necessary to ensure the position is maintained

# OPERATIVE TRT

- Indicated for :

1: unstable hips

2: fractures distorting the normal ball and socket congruence

3: Associated fracture of femoral head and retained bone fragments in joint

The aim should be **perfect anatomical reduction**

\* what are the fractures of hip →

- neck of femur
- Inter trochanteric
- sub Trochanteric

# HIP JOINT

\* Risk factors  
of hip fracture?  
osteoporosis + old age

The hip joint is a synovial articulation between the head of the femur and the acetabulum of the pelvic bone.

The joint is a multiaxial ball and socket joint designed for stability and weight bearing at the expense of mobility.

Movements at the joint include flexion, extension, abduction, adduction, medial and lateral rotation, and circumduction.

## Possible hip movements

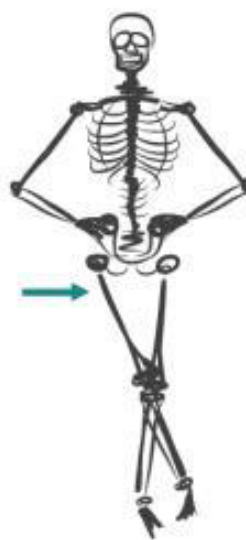
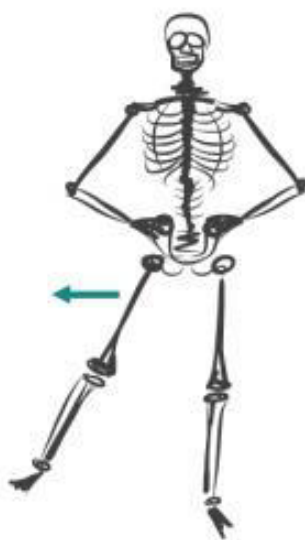
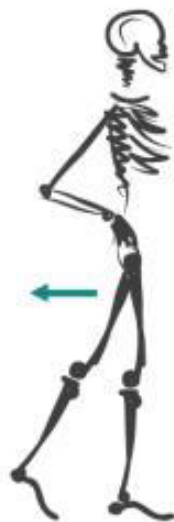
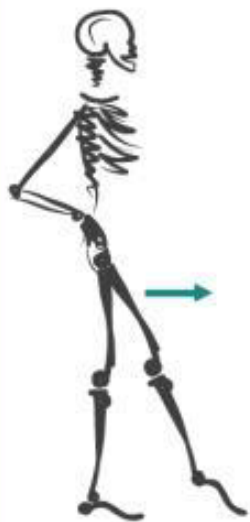
FLEXION

EXTENSION

ABDUCTION

ADDUCTION

EXTERNAL / INTERNAL ROTATION



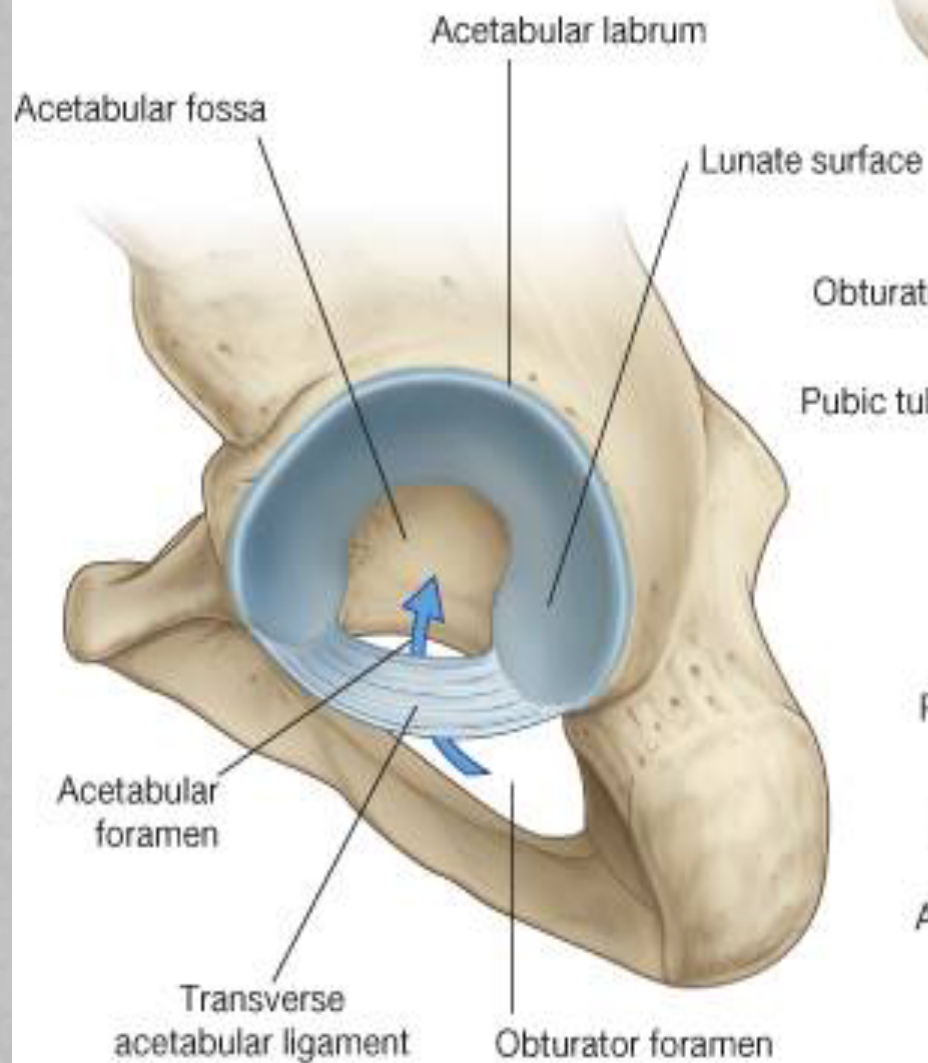
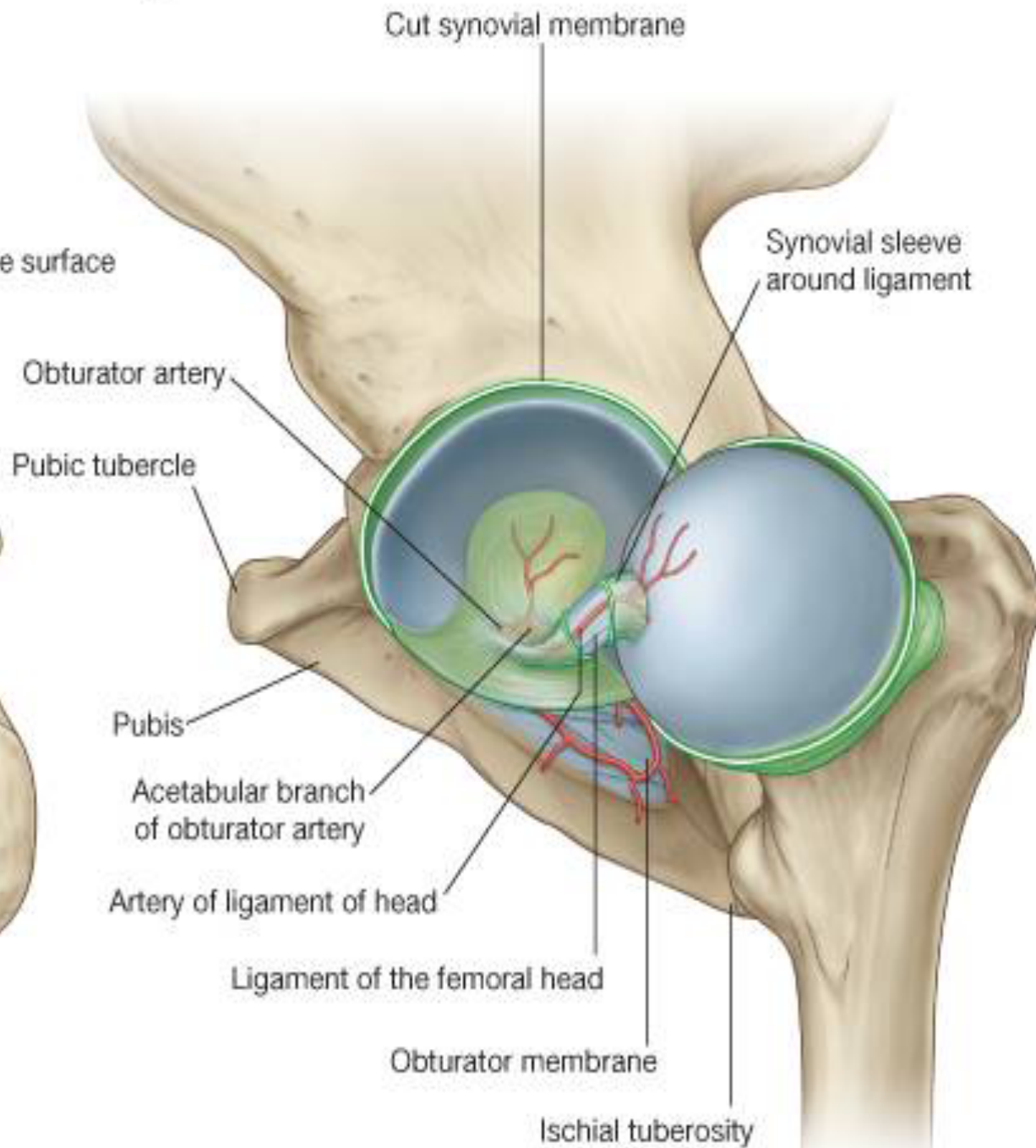


The articular surfaces of the hip joint are:

- the spherical **head of the femur**
- the lunate surface of the **acetabulum of the pelvic bone.**

The acetabulum almost entirely encompasses the hemispherical head of the femur and contributes substantially to joint stability.

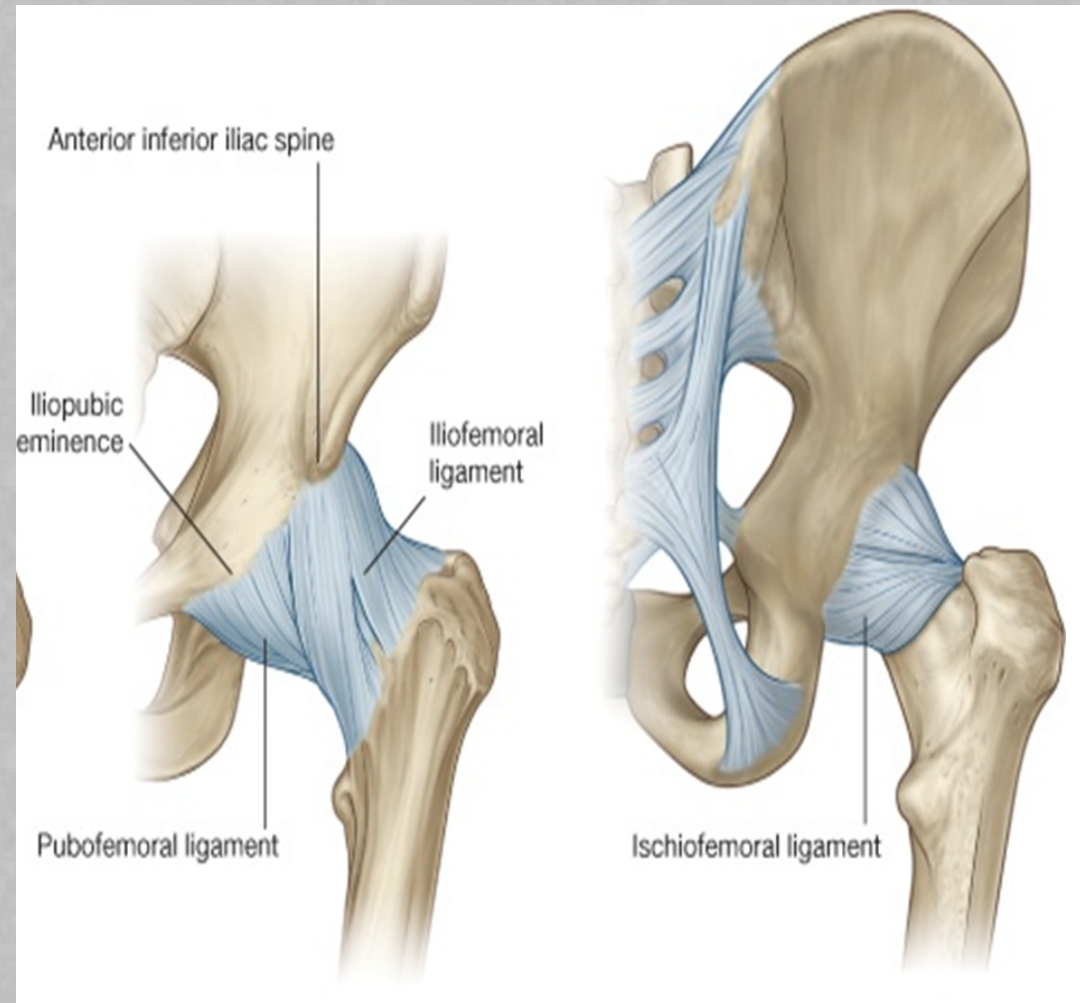
**Except for the fovea, the head of the femur is also covered by hyaline cartilage.**

**A****B**

# LIGAMENTS

Three ligaments reinforce the external surface of the fibrous membrane and stabilize the joint:

1. iliofemoral
2. pubofemoral
3. ischiofemoral



# The Femur

The femur is the longest and heaviest bone in the body.

It articulates above with the acetabulum to form the hip joint and below with the tibia and the patella to form the knee joint.

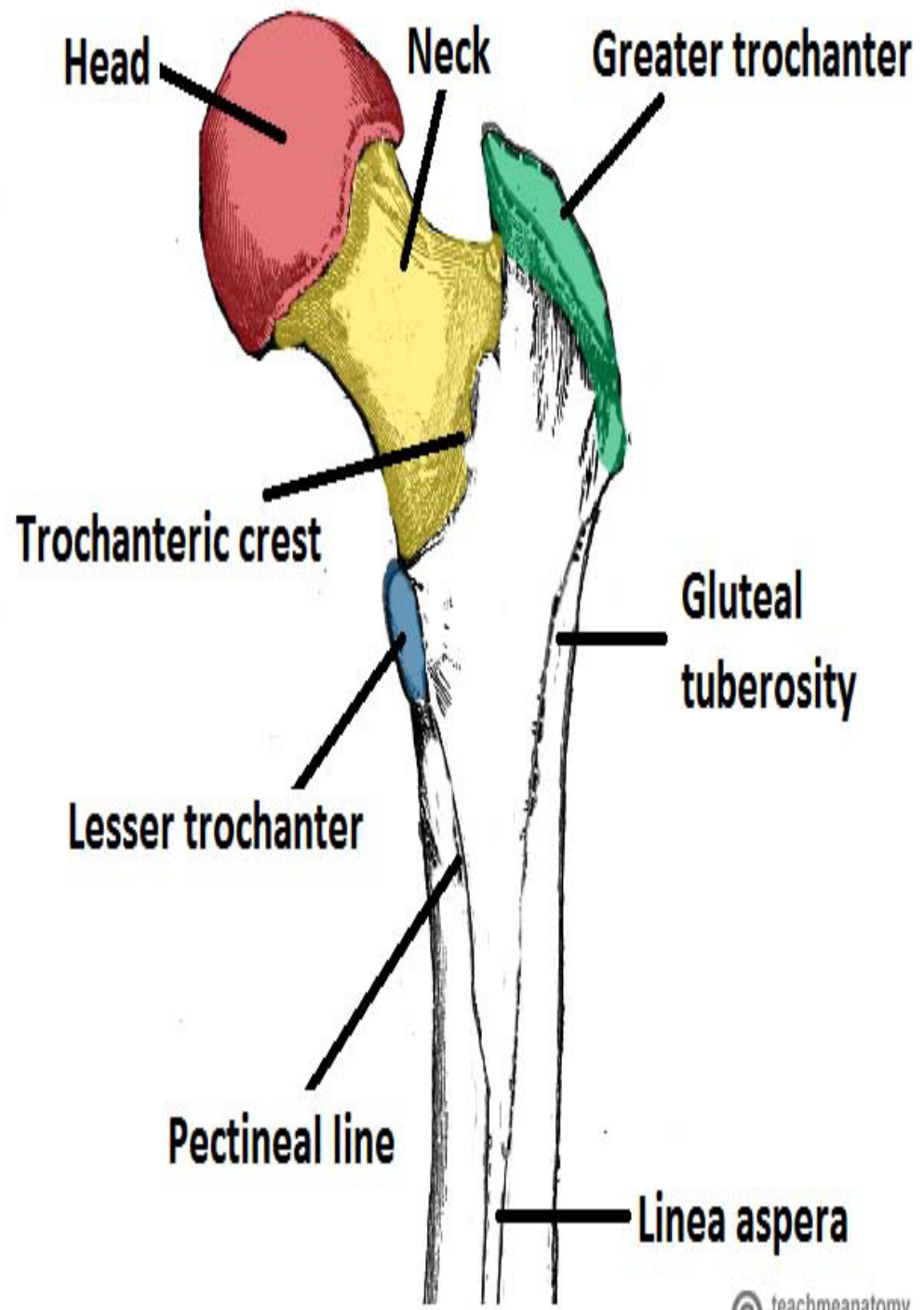
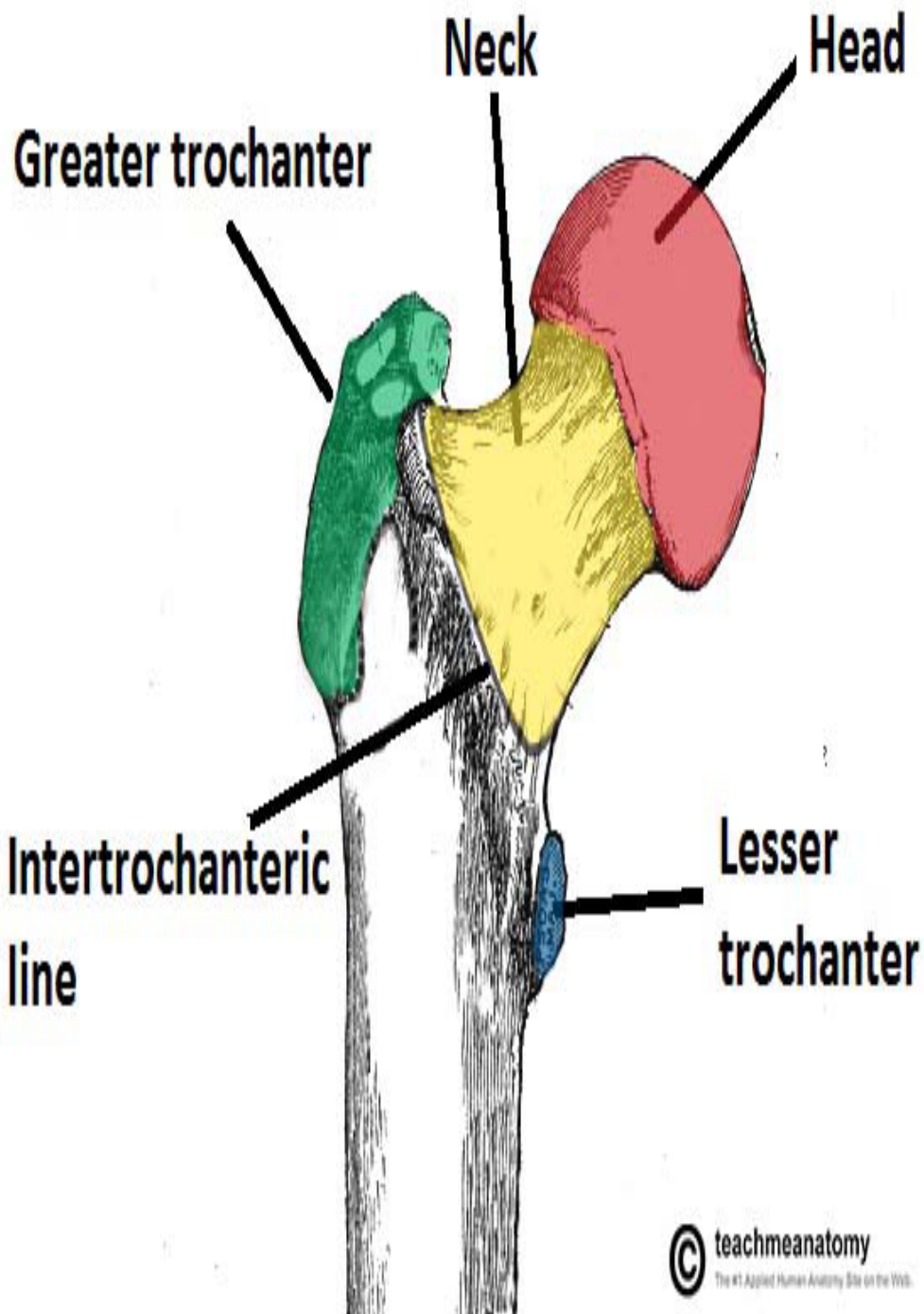
The upper end of the femur has a head, a neck, and greater and lesser trochanters.

The head forms about two thirds of a sphere and articulates with the acetabulum of the hip bone to form the hip joint.

**In the center of the head is a small depression,** called the fovea capitis, for the attachment of the ligament of the head. Part of the blood supply to the head of the femur from the obturator artery is conveyed along this ligament and enters the bone at the fovea.

The neck, which connects the head to the shaft, passes downward, backward, and laterally and makes an angle of about  $125^\circ$  (slightly less in the female) with the long axis of the shaft. The greater and lesser trochanters are large eminences situated at the junction of the neck and the shaft.

Connecting the two trochanters are the intertrochanteric line anteriorly, where the iliofemoral ligament is attached, and a prominent intertrochanteric crest posteriorly.



# HIP DISLOCATION



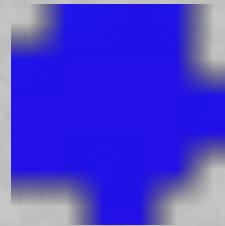
The incidence of hip dislocation has paralleled the rise in number of road accidents.

It's classified as :

**1-Posterior (most common)**

**2-Anterior**

**3-Central**



Hip dislocation can be either a simple dislocation or it can be a fracture dislocation which involves the posterior wall of the acetabulum or the femoral head.

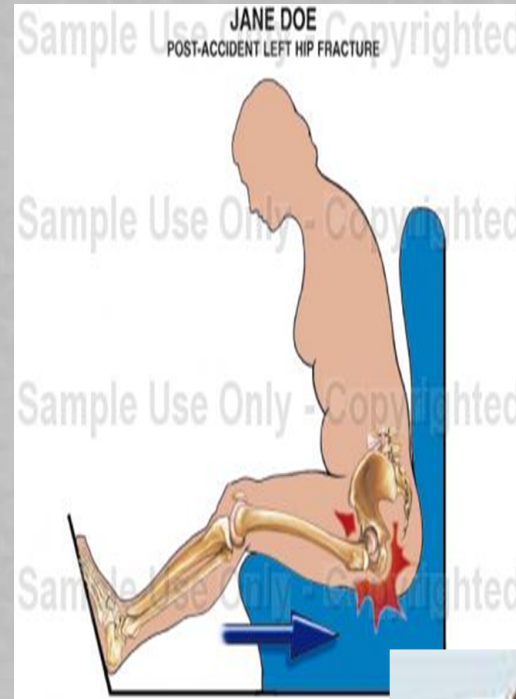
# POSTERIOR DISLOCATION

## ? Mechanism:

Usually this occur in a road accident when someone seated in a truck and thrown forwards striking the knee against the dashboard.

The femur thrust in a posterior direction and the femoral head is forced out of it's socket.

Often a piece of bone at the back of the acetabulum is sheared off (fracture-dislocation).



## ? Clinical features:

In a straightforward case the diagnosis is easy:

**The leg is short, internally rotated, adducted , and slightly flexed .**

However if one of the long bones is fractured (the femur mostly) the injury can be easily missed.

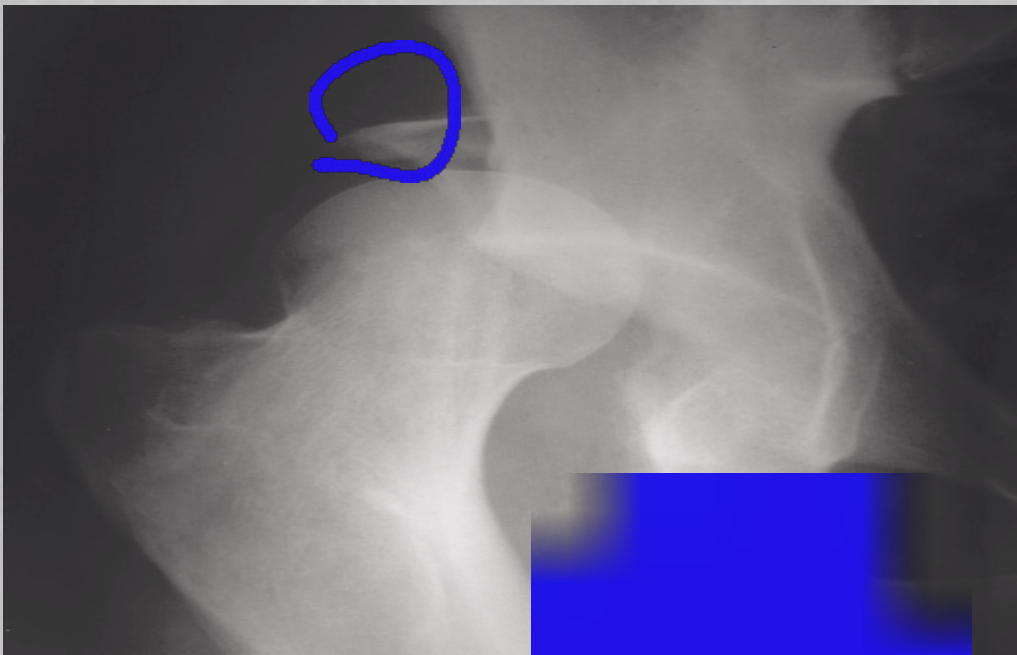
**The lower limb should be examined for signs of sciatic nerve injury.**



## ? X-ray features:

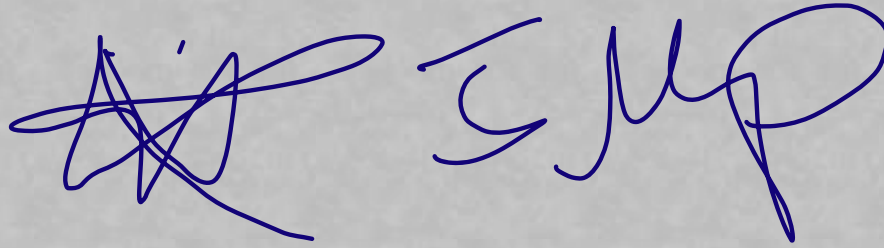
In AP film the femoral head is seen out of its socket and above the acetabulum.

Multiple views maybe needed to exclude a fracture of the acetabular rim or the femoral head.



Post Dislocation

## ? Treatment:



- ? Reduction
- ? Rest the hip (by applying traction and maintain it for 3 weeks.)
- ? Movement and exercises as soon as pain allow.
- ? after 3 weeks the patient is allowed to walk with crutches.

### How to reduce it ?

#### Under GA

An assistant steadies the pelvis.

The surgeon flexes the patient hip and knee to 90 degrees and pull the thigh vertically upwards.

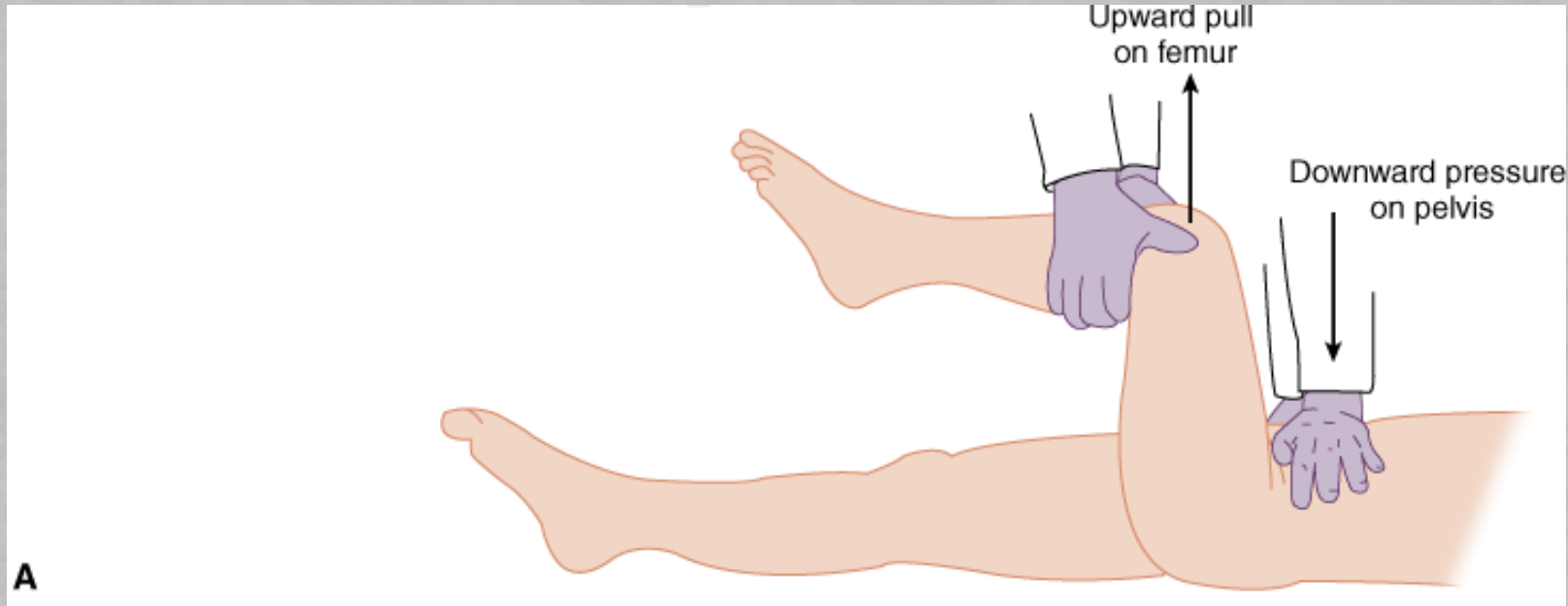
X-ray is essential to confirm reduction and to exclude fractures.

CT-scan is needed if there is suspicion that bone fragments trapped in the joint.

After reduction the hip is usually stable

→ Hip Dislocation  
Reduced on the Ground  
not on surgical table

✦ Femur Reduction Under GA ✦



✦ Hip Dislocation  
mostly posterior ✦

## ? Complications

### 1) Sciatic nerve injury:

In 10-20% of cases, it usually recovers.

Recovery often takes months and in the meantime the limb must be protected from injury and the ankle splinted to overcome the footdrop

→ after reduction in 3 weeks, the patient should try to walk

### 2) Avascular necrosis:

Occur in 10% of cases and in 40% if the reduction is delayed

If there is a small necrotic segment, realignment osteotomy is the method of choice.

In younger patients the choice is between femoral head replacement or hip arthrodesis

In patients >50 years : total hip replacement is better.

### **3) Osteoarthritis** (secondary) and its due to:

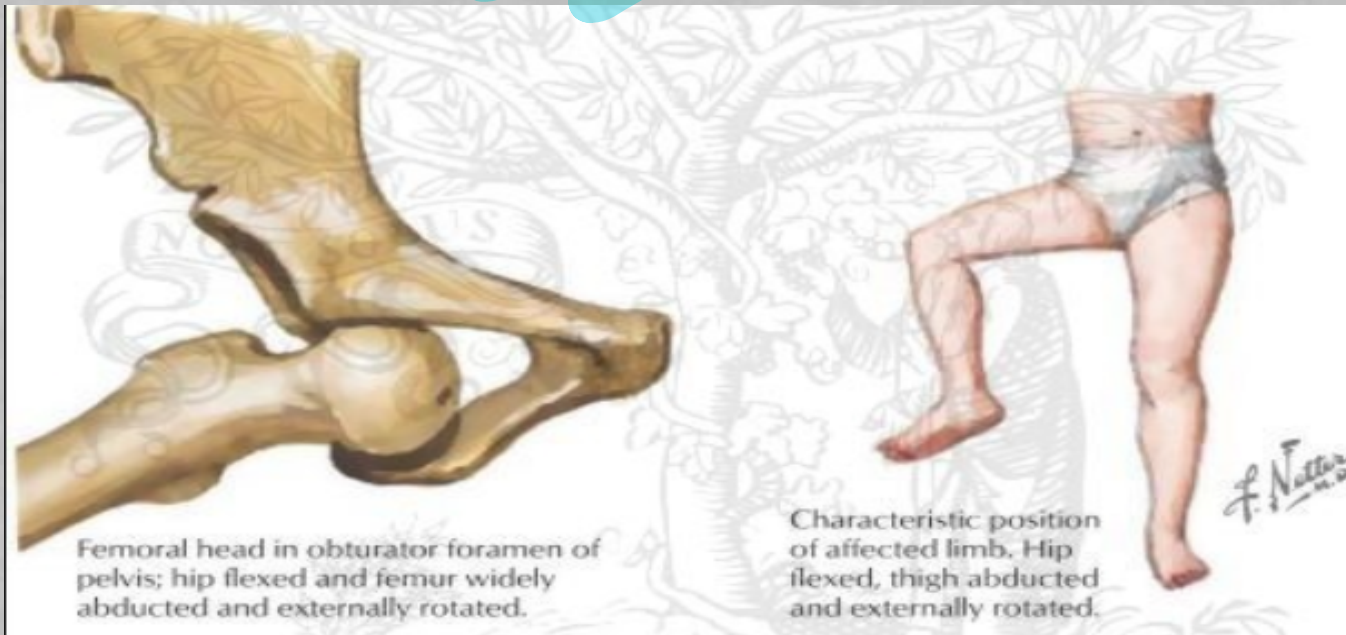
- Cartilage damage at the time of the dislocation.
- The presence of retained fragments in the joint.
- Ischemic necrosis of the femoral head.



# ANTERIOR DISLOCATION

It is rare when compared with posterior dislocation.

The leg lies externally rotated, abducted and slightly flexed.



## ? X-ray features:

In the AP view the dislocation is usually obvious, but occasionally the head is almost directly in front of its normal position. Any doubt is resolved by a lateral film.

*Anterior Dislocation*



## ? Treatment

The maneuvers employed are almost identical to those used to reduce a posterior dislocation, except that while the flexed thigh is being pulled upwards, it should be adducted.

An assistant then helps by applying lateral traction to the thigh.

## ? complications

Avascular necrosis.





Anterior dislocation



Posterior dislocation

# CENTRAL DISLOCATION

---

A fall on the side, or a blow over the greater trochanter, may force the femoral head medially through the floor of the acetabulum.

Although its called central dislocation it is really a complex fracture of the acetabulum.



## Table 29.1 Classification of hip dislocation (Thompson and Epstein).

Types	Thompson and Epstein classification of hip dislocations
I	Dislocation with no more than minor chip fractures
II	Dislocation with single large fragment of posterior acetabular wall
III	Dislocation with comminuted fragments of posterior acetabular wall
IV	Dislocation with fracture through acetabular floor
V	Dislocation with fracture through acetabular floor and femoral head



Type I



Type II



Type III







Type IV



Type V

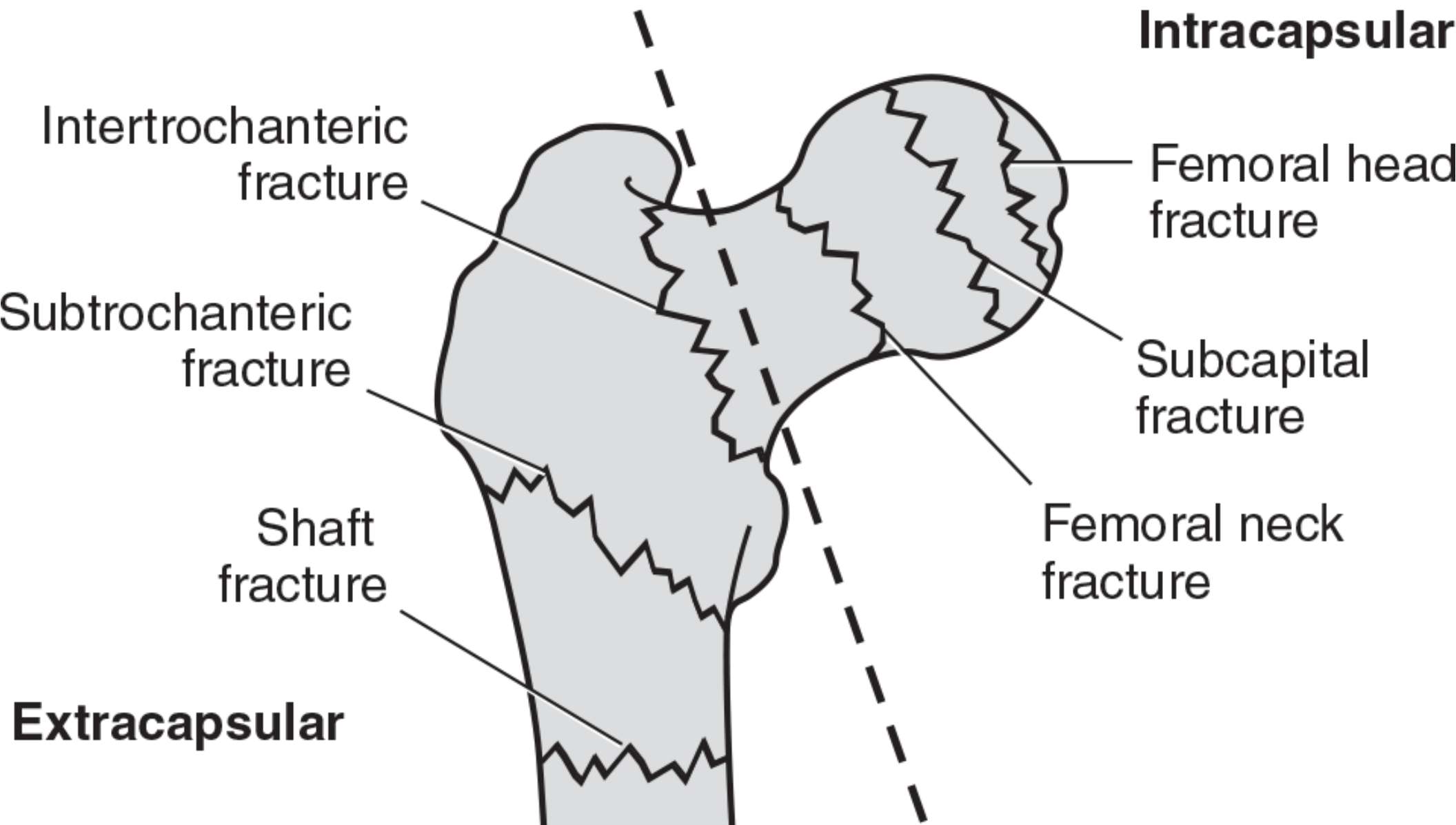
# Classification of femoral head fracture

Pipkin classification of femoral head fractures

			
Type I	Type II	Type III	Type IV
The fracture line is inferior to the fovea	The fracture fragment includes the fovea	As with types I and II but with an associated femoral neck fracture	Any pattern of femoral head fracture and an acetabular fracture (coincides with Thompson and Epstein's type V)

## 29.2 Pipkin classification of femoral head fractures





**Intracapsular**

Intertrochanteric fracture

Femoral head fracture

Subtrochanteric fracture

Subcapital fracture

Shaft fracture

Femoral neck fracture

**Extracapsular**

# Fracture of the femoral neck

## ? **Mechanism:**

The fracture usually result from a **fall directly onto the greater trochanter**. In **young** individuals : the usual cause is a **fall** from a height or a blow sustained in a road accident, these patients often have multiple injuries and in 20% there is an associated fracture of the femoral shaft.

**However this injury is most commonly seen in elderly osteoporotic people** (less force is required such as slip and fall on the hip).

## ? Clinical features:

There is usually history of a fall followed by a pain in the hip.

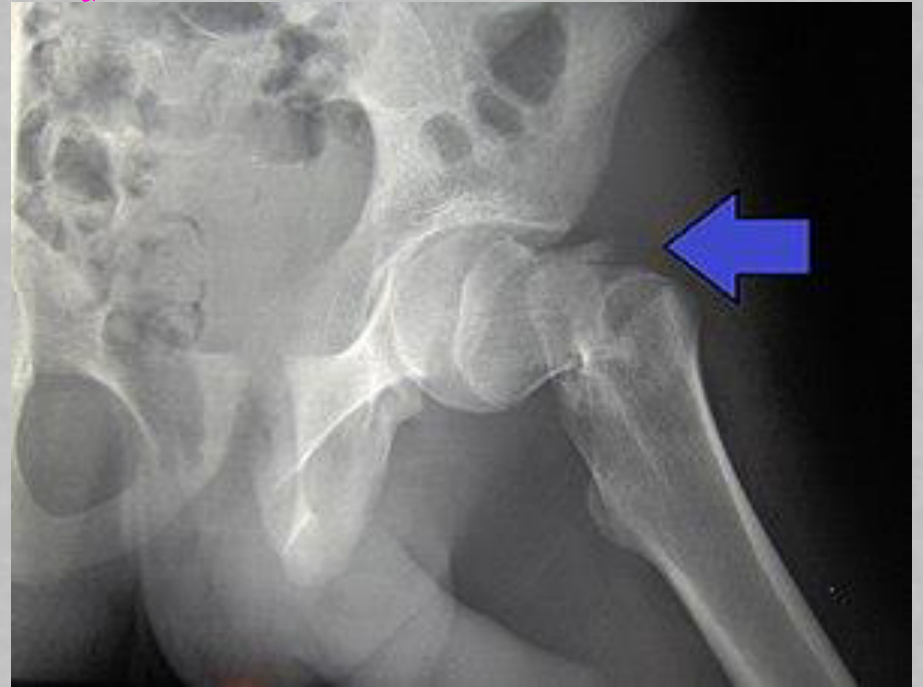
If the fracture is displaced the patient lie with limb in the lateral rotation and the leg looks short.

Inability to bear weight

Inability to move hip

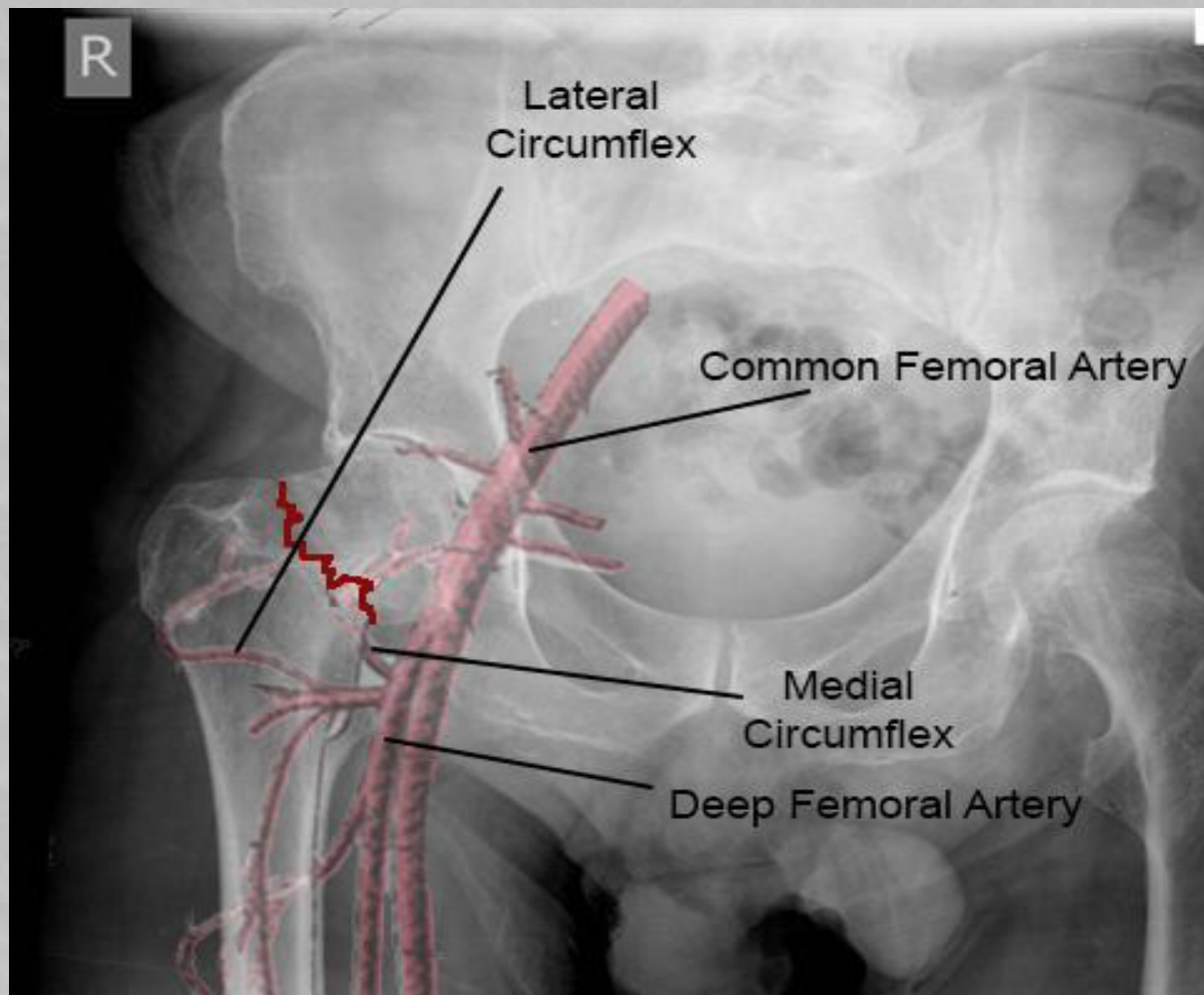
Bruising on the hip region

*Cebral  
Dislocation*



## **? Complications:**

Displaced fracture have a high rate of non-union and avascular necrosis ( with displaced fracture there is an increased risk of damage to the femoral head blood supply and thus significant incidence of AVN . )



## ? X-ray features:

Usually the break is obvious.



# ? Garden classification

## GARDEN CLASSIFICATION OF NECK OF FEMUR FRACTURE

\*based on severity



**Garden I fracture**  
incomplete and minimally displaced.



**Garden II fracture**  
complete, nondisplaced.



**Garden III fracture**  
complete fracture and partially displaced.



**Garden IV fracture**  
completely displaced, with no engagement of the 2 principal fragments.

Shortening and external rotation of lower extremity

# Femoral Neck Fracture Classification

## Pauwel's Classification

As the fracture progresses from Type I - Type III, the obliquity of the fracture line increases.



# ? Treatment:

The principles are accurate reduction, secure fixation and early activity (prevent thromboembolism).

Under anaesthesia, the fracture is manipulated and reduction is checked by x-ray. If it is satisfactory, the fracture is securely fixed with cannulated screws, or with a sliding ('dynamic') compression screw which attaches to the femoral shaft.

- Operative treatment is almost mandatory.
- Displaced fracture will not unite without internal fixation.
- Impacted fractures can be left to unite, but there is always a risk that they may become displaced, even while lying in bed, so internal fixation is safer.





# complications

*Hip blood supply?*

## Local complication:

### 1. Avascular necrosis

*very common complication*

Occur in 10% of patient with undisplaced fractures and in 30% of those with displaced fractures.

### 2. Non-union

More common in severely displaced fractures , in third of patient.

Treatment :

<50yrs: placing a bone graft across the fracture and reinserting a fixation device.

>50yrs: prosthetic replacement of the femoral head, or total replacement of the joint.

### 3. Osteoarthritis

Subarticular bone necrosis or femoral head collapse may lead, after several years, to secondary Osteoarthritis, if the symptoms warrant it the joint should be replaced.

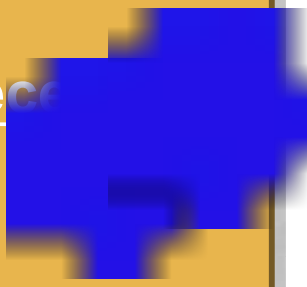
## General complication:

There is a high incidence of them especially in elderly like:

### 1. Thromboembolism/Fat embolism

### 2. Bed sores

### 3. Infection/Septic Pnuemonia



# Intertrochanteric Fractures

## ? Mechanism:

they are more common in elderly and osteoporotic women.

extracapsular intertrochanteric fracture occur through cancellous bone, which has an excellent blood supply - hence, heals well  
They unite very easily and seldom cause avascular necrosis.

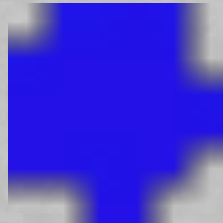
## ? Clinical features:

following a fall, the patient is in a pain and unable to stand. The limb is shortened and lies in external rotation.



## ? X-ray features:

The fracture usually runs more or less diagonally from the greater to the lesser trochanter, it may be comminuted & severely displaced. In some cases the crack can hardly be seen.



# Kyle classification of intertrochanteric fractures



TYPE 1  
Undisplaced  
Uncomminuted



TYPE 2  
Displaced  
Minimal comminuted  
Lesser trochanter fracture  
Varus



TYPE 3  
Displaced  
Greater trochanter fracture  
Comminuted  
Varus

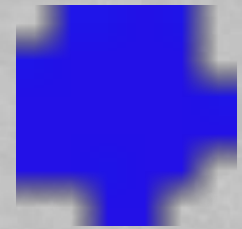


TYPE 4  
Severely comminuted  
Subtrochanter extension  
(Also reverse oblique)

A reverse oblique fracture is an unstable fracture that is not a classic intertrochanteric fracture, it starts from medial proximal to lateral distal and extends to include the lateral cortex distally.



## ? Treatment



They are almost **always treated by early internal fixation** because they fail to unite with conservative treatment.

? obtain the best possible position

? to get the patient up and walking as soon as possible.

The fracture is reduced under X-ray control and then fixed with compression screw and plate.

The patient is allowed to walk, partially weight bearing, using crutches until the fracture has united (8-12 weeks).

Severely comminuted and 'reverse' fractures are inherently unstable and require more complex fixation.

## ? **Complications:**

1- General complication: thromboembolism, pneumonia, bed sores.

2- Failure of fixation

3- **Malunion** (mainly varus and external rotation) they are seldom severe.

# Subtrochanteric Fractures

## ? Mechanism:

May occur at any age if the injury is severe enough, but most occur with relatively trivial injury, in elderly patient with osteoporosis, osteomalacia, Paget disease or secondary deposits.

Blood loss is greater than with femoral neck or intertrochanteric fractures.

## ? Clinical features:

Leg lies externally rotated and short.

Thigh is extremely swollen.

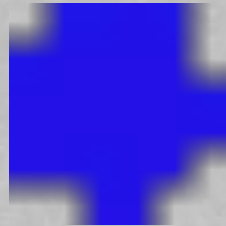
Movement very painful





## ? X-ray features:

The fracture is through or below the lesser trochanter and is frequently comminuted.



## ? Treatment:

Open reduction and internal fixation is the treatment of choice.

## ? Complications:

**Malunion** and if marked may need operative correction.

*THANK YOU ^^*