Fractures of hip joint

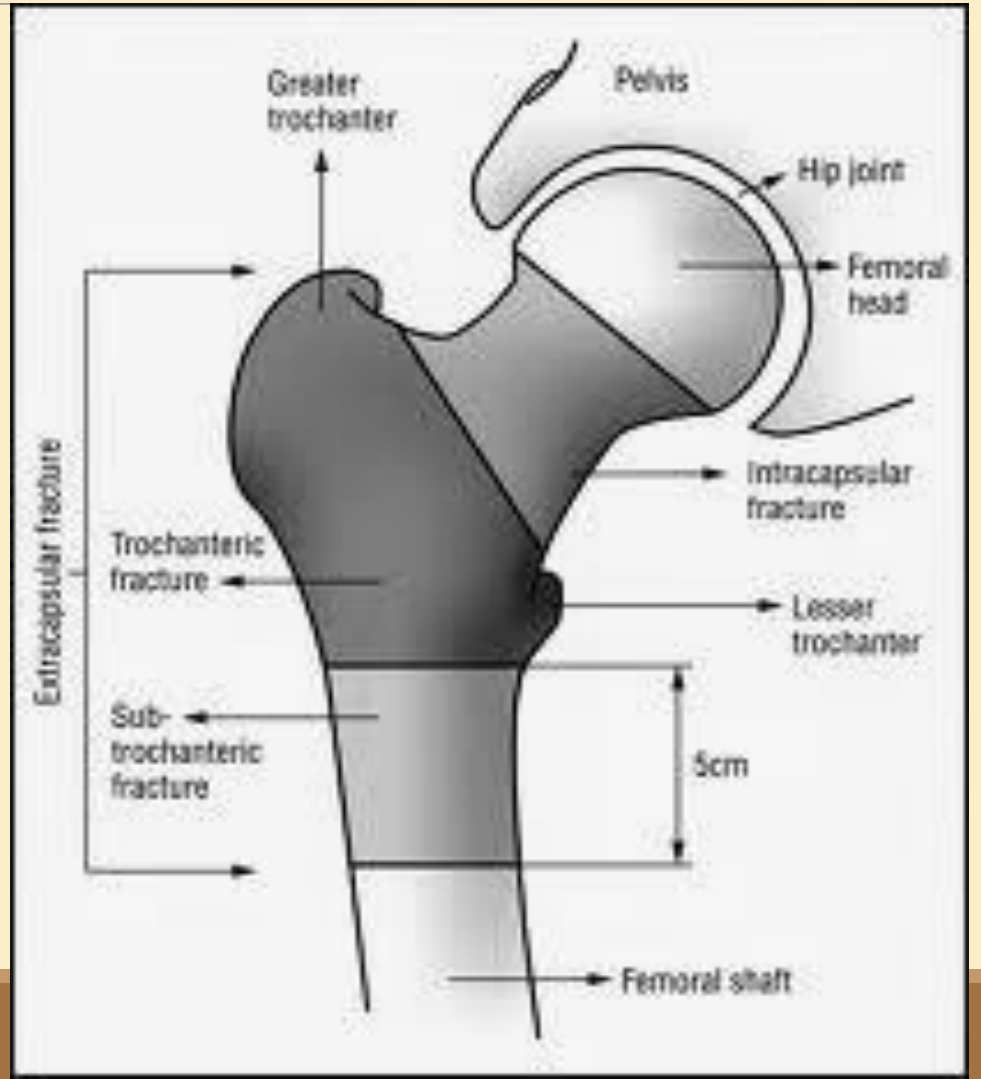
Incidence

- Hip fractures are an important health-care concern in the elderly population.
- Currently, hip fractures affect 18% of women and 6% of men globally.
- About half of all hip fractures in the United States are intertrochanteric, 37% are femoral neck, and 14% are subtrochanteric.
- Intertrochanteric fractures are associated with poorer health status compared with femoral neck fractures, and their relative incidence increases with age.

Classification of Hip Fractures

Hip fractures is classified into intracapsular and extracapsular fractures

1. Intracapsular fractures (femoral neck fractures): Occurs within the hip capsule; accounts for 45% of all acute hip fractures in the elderly; susceptible to malunion/avascular necrosis of the HOF because of the limited blood supply to the area.



Extracapsular fractures:

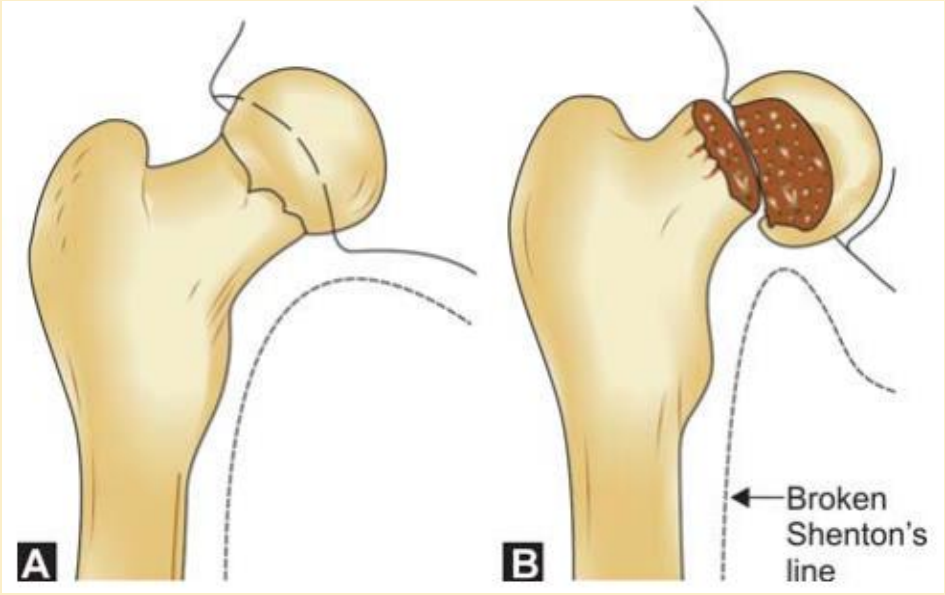
- Intertrochanteric fracture: occurs between the greater and the lesser trochanter, intertrochanteric region has a good blood supply, avascular necrosis or nonunion is rare.

- Subtronchanteric fracture: occurs below the lesser trochanter, approximately 2.5 inches below.

FRACTURE NECK of FEMUR

Definition

It is fracture occurring proximal to the intertrochanteric line in the intra-capsular region of the hip



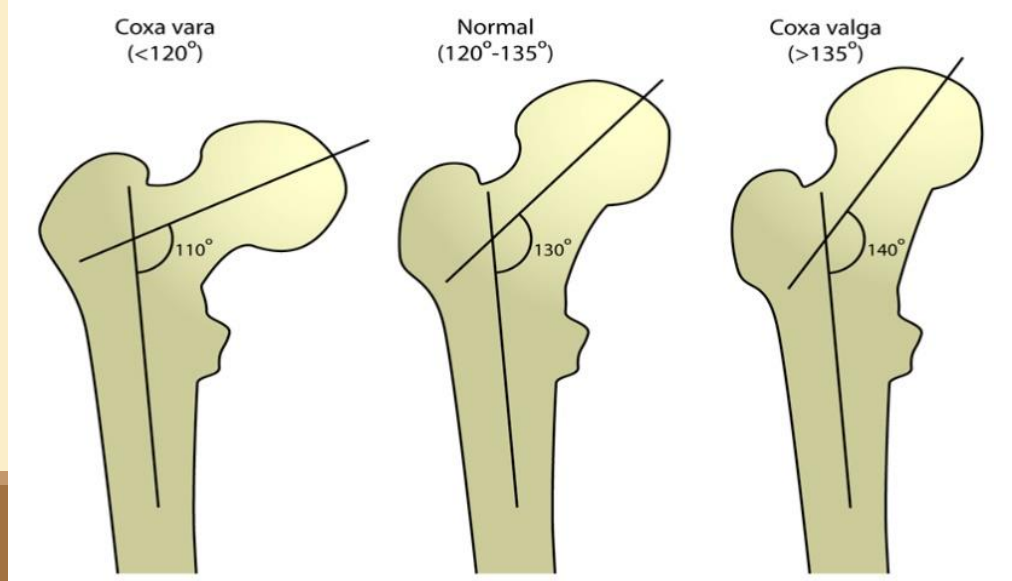
Mechanism of Injury

- Majority are due to fall, as a result of direct blow over the greater trochanter.
- Second mechanism is mainly due to lateral rotation of the extremity which causes marked posterior comminution of the neck.
- Major trauma in young adults like road traffic accident (RTA).

Biomechanics: Forces

The NOF experiences the highest stress loads within the femur. Forces that are acting on the femoral neck are:

1. Externally generated: a result of GRF that translated from the ankle to the NOF as a result of the vertical impact and typically stay below 1.3 times BW during low-speed walking.
2. Internally generated: a result of the muscles acting on the bone to accomplish the desired movements and maintain balance. Internally generated forces are typically 2-3 times BW during low-speed walking.



The internal and external forces produce bending and torsional moments that act on the NOF

- The bone strain is largest at the inferior aspect of the NOF, resulting in a larger thickness of the inferior aspect of NOF bone cortex compared to the superior aspect.

- The superior aspect of the femoral neck experiences increased strain during activities like stair climbing where there is an increase in hip flexion and abduction. The increased strain is due to the increase of torsion at the femoral neck.

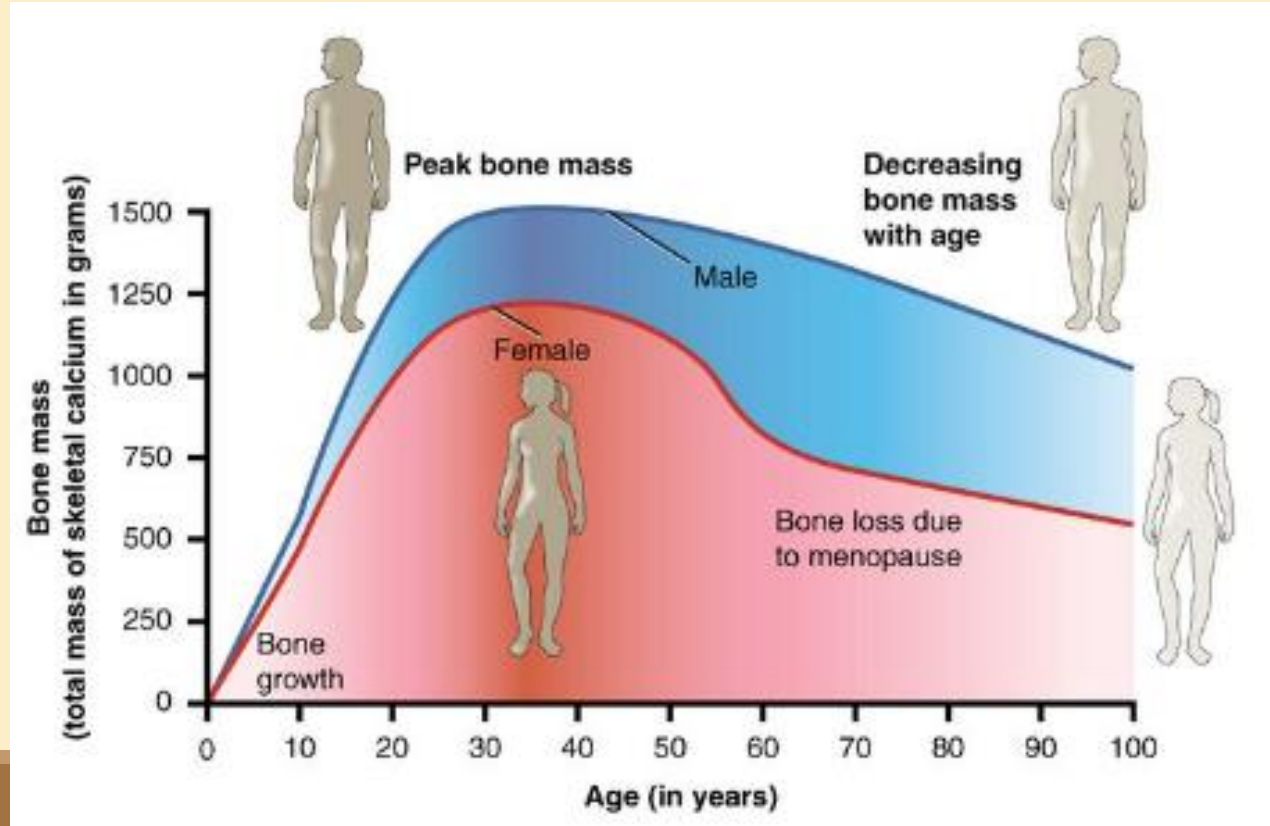
Clinical Features

- Groin pain, antalgic gait and restriction of hip movements.
- Tenderness over the anterior hip joint line.
- Minimal shortening and external rotational deformity of the affected limb.
- ASLR is difficult.

Fracture risk

Fracture risk is determined by the bone strength and the applied load.

- Bone strength: Bone Density at the femoral neck and the cortical bone thickness and bone density.
- Bone porosity: assessed through a bone biopsy, strong predictor of mechanical strength.



Radiograph

Plain X-ray of the hip, AP and lateral views helps to make a diagnosis.

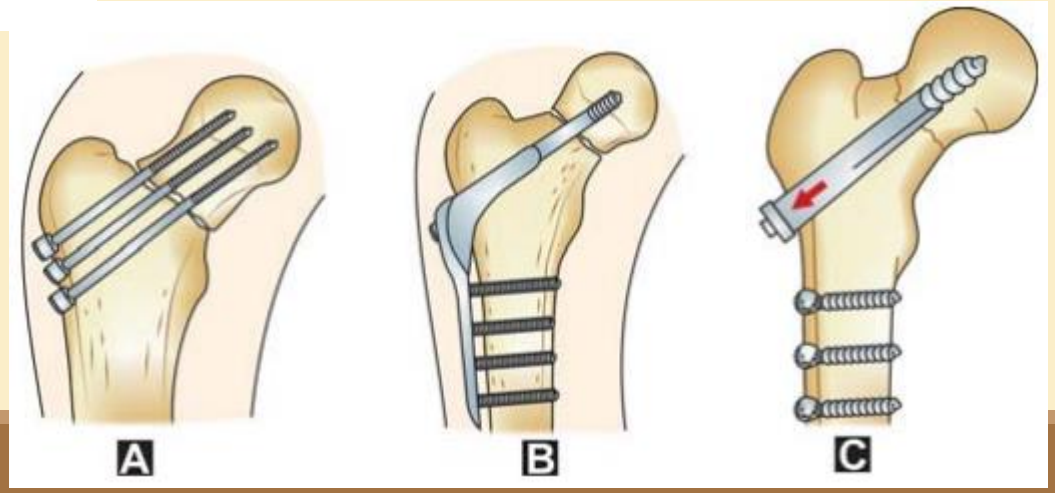
Physical Examination

On physical examination, findings may include the following:

- limited and painful hip ROM, especially in internal rotation.
- the injured leg is shortened, externally rotated, and abducted in the supine position
- Ecchymosis may or may not be present.
- An antalgic gait pattern may be present.
- Tenderness to palpation around the inguinal area, over the femoral neck. This area may also be swollen.
- Increased pain on the extremes of hip rotation, an abduction lurch, and an inability to stand on the involved leg

Treatment

Age group	*Undisplaced*	*Displaced*
> 70 years	• Dynamic hip Screws (DHS)	• Prosthesis • Total hip replacement (THR) • Bipolar arthroplasty
Young adults	• DHS • Cannulated Screws (ASNIS)	• DHS • Later osteotomy or prosthesis



Rehabilitation Objectives

Range of Motion:

Improve and restore range of motion of the knee and hip

Motion	Normal	Functional
Knee		
Flexion	130–140°	110°
Extension	0°[a]	0°[a]
Hip		
Flexion	125–128°	90–110°
Extension	0–20°	0–5°
Abduction	45–48°	0–20°
Adduction	40–45°	0–20°
Internal rotation	40–45°	0–20°
External rotation	45°	0–15°

Muscle Strength: Improve the strength of the muscles that are affected by the fracture.

- Gluteus medius: hip abductor, most important for postoperative stability.
- Iliopsoas: hip flexor.
- Gluteus maximus: hip extensor.
- Hip adductors: Adductor magnus, longus, and brevis.
- Quadriceps: knee extensor, especially the lateralis, because it is exposed during surgery.
- Hamstrings: knee flexor.

Functional Goals: Normalize the patient's gait pattern. Achieve 90 degrees hip flexion for proper sitting position.

During the 1st week: Femoral neck fracture Physiotherapy Management

- The wound is inspected for evidence of infection and the drains are removed after 24 hours.
- Pulmonary embolism and hypovolaemia are a distinct possibility and a careful watch is kept to prevent bedsores from developing, the patient is frequently turned in the bed.

a. Movements: A full AROM of the ankle, gentle active flexion and extension of the hip and knee is permitted.

b. Exercises:

- After the pain subsides, isometric gluteal and quadriceps exercises are begun.
- Isotonic exercises are prescribed for the ankle

c. Weight-bearing:

- By the end of first week, WB with the help of a crutch or walker using a 3-point gait may be permitted.
- For patients with endoprosthesis, WB as tolerated is permitted.

d. ADL:

- Use of raised toilet seat and chair
- wearing the trousers from the affected limb first and removing it from the unaffected limb,
- rolling on to the unaffected side before getting up from the bed are some of the recommended modifications in daily living.

2-4 weeks: Femoral neck fracture Physiotherapy Management

a. Movements:

- Active and AA-ROM of the hip, knee and ankle can now be started.
- no passive movements are still recommended.

b. Exercises:

- Ankle isotonic exercises are continued.
- Isometric exercises for the hip and knee are prescribed.

c. Weight-bearing: This has to be done on the following lines:

- Patient may now be allowed to bear the weight on the affected extremity either partially or fully depending on the stability of the fracture.
- A 3-point gait using crutches or walker is advised.

d. Activities of daily living: Modifications in activities of daily living are the same as mentioned earlier.

4-8 weeks: Femoral neck fracture Physiotherapy Management

- The patient can flex the hip up to 90 degree, dragging the heel up to the buttocks with the help of the normal leg).
- The patient can be encouraged to sit with the legs hanging over the edge of the bed and supporting and lifting the affected limb with the unaffected leg.
- Assisted and self-resistive exercises for the hip and knee muscles can be carried out.

After 8 weeks: Femoral neck fracture Physiotherapy Management

- PROM manually or by continuous passive motion apparatus is begun to the hip and knee.
- Isotonic and isokinetic exercises to the hip and knee are initiated along with progressive resistive exercises.
- WB with the affected extremity with the help of crutches or walker using a four point gait can be initiated as the patient can bear more weight now.
- ADL can be allowed normally with the help of assistive devices.

By 12-16 weeks: Femoral neck fracture Physiotherapy Management

- Full weight-bearing is allowed.
- Full active and passive ROM exercises are permitted to the hip and knee joints.
- Isometrics, isotonic and progressive resistive exercises are continued to the hip, knee and ankle joints.
- Patient can now carry out all the activities of daily living independently.

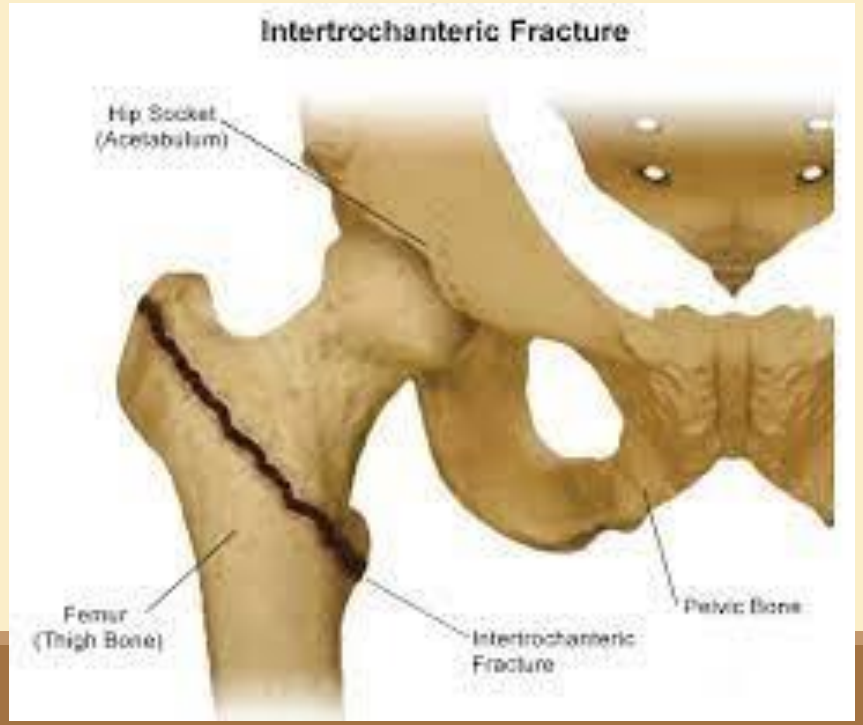
LONG-TERM PROBLEMS

- Avascular necrosis of the femoral head may require prosthetic replacement if it becomes symptomatic and causes pain.
- Non-union may require prosthetic replacement of the femoral head and neck.
- Leg-length discrepancy is rare, but may be a long-term problem requiring a shoe lift.
- Prominent and painful screws, pins, and plates may require removal.

INTERTROCHANTERIC FRACTURE

Definition

- An intertrochanteric fracture occurs along a line between greater trochanter and lesser trochanter with variable comminution.
- Sex: More common in females to males (2.8:1).



Mechanism of injury

- Direct trauma as in RTA, fall.
- Falls occurring in patients with senile and post-menopausal osteoporosis account for most of these fractures

Clinical Features

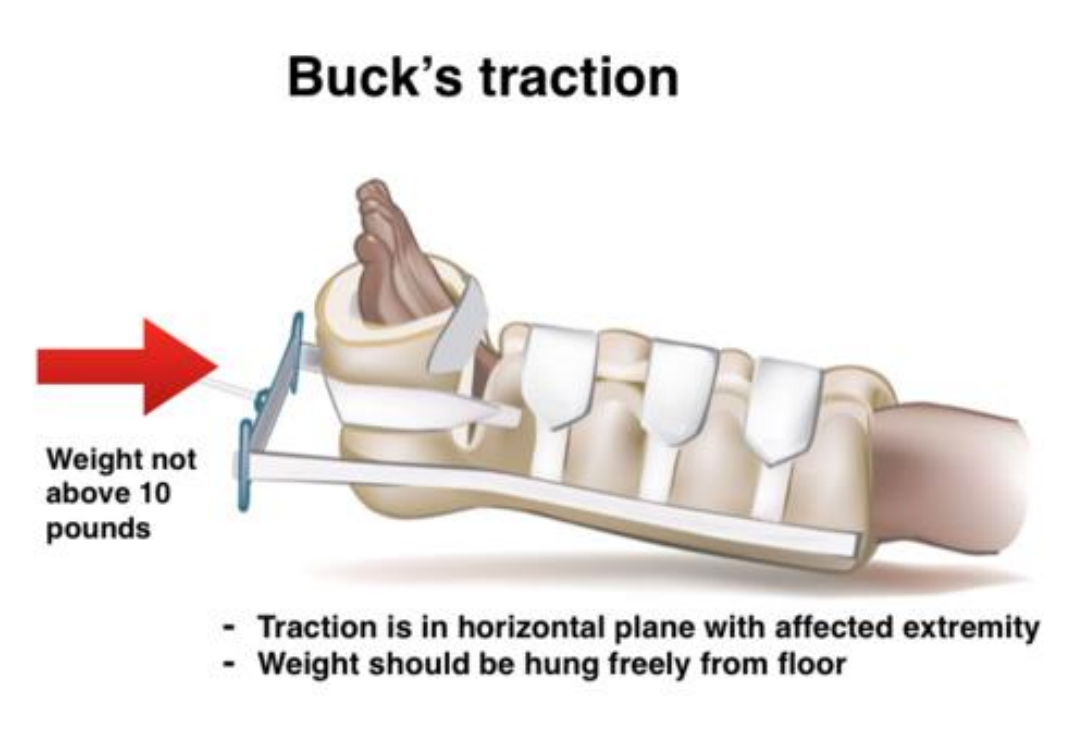
- Pain, marked shortening of the lower limb, complete external rotation deformity.
- Swelling, ecchymosis and tenderness over the greater trochanter.

Radiograph

Plain X-ray of the hip helps confirms the diagnosis.

Treatment Methods

- ORIF: Sliding hip screw nail provides internal fixation.
- Skeletal traction: Buck's traction.



Rehabilitation objectives

Range of Motion

- Restore and improve hip ROM to enable the patient to sit properly (90 degrees flexion) and climb stairs.
- Maintain FROM of the knee and ankle

Motion	Normal	Functional[a]
Flexion	125–128°	90–110°
Extension	0–20°	0–5°
Abduction	45–48°	0–20°
Adduction	40–45°	0–20°
Internal rotation	40–45°	0–20°
External rotation	45°	?0–15°

Muscle Strength: Restore and maintain the strength of muscles that cross the hip joint and effect hip joint functions.

- Hip extensor: gluteus maximus
- Hip abductor: gluteus medius
- Hip flexor: iliopsoas
- Hip adductors: adductors magnus, longus, and brevis. Avoid strengthening the adductor group of muscles until the fracture is stable because they stress the fracture site and any implant (sliding hip screw)
- Knee extensor: quadriceps
- Knee flexor: hamstrings

Functional Goals: Normalize gait pattern and achieve a proper sitting position.

One day- one week
Precaution • Avoid PROM • Avoid torsion or twisting at the fracture site.
Range of Motion Gentle AROM exercises to hip and knee in flexion, extension, abduction, and adduction.
Muscle strength Isometric exercises to glutei and quadriceps.
Functional activities • Stand-pivot transfers if NWB. If weight bearing, the affected extremity is used during transfers. • A raised toilet seat is used to decrease hip flexion.
Weight Bearing • WB as tolerated for stable fractures. • Toe-touch to partial or non-weight bearing for unstable fractures.

Two weeks
Precaution • Avoid PROM • Avoid torsion or twisting at the fracture site.
Range of Motion AROM to hip and knee. Achieve 90 degrees hip flexion.
Muscle strength Isometric exercises to glutei, quadriceps, and hamstrings.
Functional activities • Stand-pivot transfers if NWB. If weight bearing, the affected extremity is used during transfers. • For ambulation, use two- or three-point gait with assistive devices.
Weight Bearing • Weight bearing as tolerated for stable fractures. • Toe-touch to partial or non-weight bearing for unstable fractures.

4-6 week
Precaution • Avoid PROM • Avoid torsion or twisting at the fracture site.
Range of Motion Active, active-assistive ROM to hip and knee.
Muscle strength • Isometric exercises to glutei, quadriceps, and hamstrings. • Active resistive exercises to quadriceps, glutei, and hamstrings, if motion is well tolerated.
Functional activities • Stand-pivot transfers if NWB. • If weight bearing, the affected extremity is used during transfers. • For ambulation, use two- or three-point gait with assistive devices.
• Weight bearing as tolerated for stable fractures. • Toe-touch to partial or non-weight bearing for unstable fractures.

8- 12 week
Precaution: None
Range of Motion • Continue active, active-assistive range of motion. • Start PROM and stretching to hip and knee.
Muscle strength Progressive resistive exercises to hip and knee.
Functional activities • The patient uses involved extremity with WB as tolerated or FWB during transfers and ambulation. • Weaning from assistive devices.
Weight Bearing: full

LONG-TERM PROBLEMS

Orthopaedic Considerations:

Nonunion is a rare occurrence, often associated with loss of fixation. If nonunion occurs, it may be treated by restoring rigid fixation and bone grafting.

Rehabilitation Considerations

- A shortened limb may be treated with a shoe lift if the discrepancy results in a limp or in back pain. This may occur with shortening of 1 inch or greater.

- Patients are often unsteady or have some imbalance from weakness. If this unsteadiness does not respond to strengthening and balancing exercises, the patient may need to use a **cane**. If the patient is unstable with a cane, a quad cane or walker might be needed.

- Antalgic gaits are usually secondary to prominent hardware.

- An (Trendelenburg gait) may also occur if the greater trochanter was fractured and displaced.

SUBTROCHANTERIC FRACTURE

Definition

Subtrochanteric region is defined as an area between the lesser trochanter and a point 5 cm distal to it. Subtrochanteric fracture is a difficult fracture due to problems like malunion, delayed union, nonunion, shortening, angular deformity, rotational malalignment, etc.

Mechanism of Injury

- High direct energy trauma in young individuals.
- Distal extension of intertrochanteric fracture in elderly patients.

Clinical Features

- Pain
- Swelling
- shortening, complete external rotation deformity and other usual features of fractures.

Risk factor

- Gender, females have been found to be at high risk for ST femur fractures with up to a 33% higher incidence rate compared to males.

- other risk factors include low total bone mineral density, diabetes mellitus, and the use of bisphosphonate medications for the treatment of osteoporosis.

Radiographs

Radiograph helps to study the level and pattern of fracture and thereby plan the treatment.

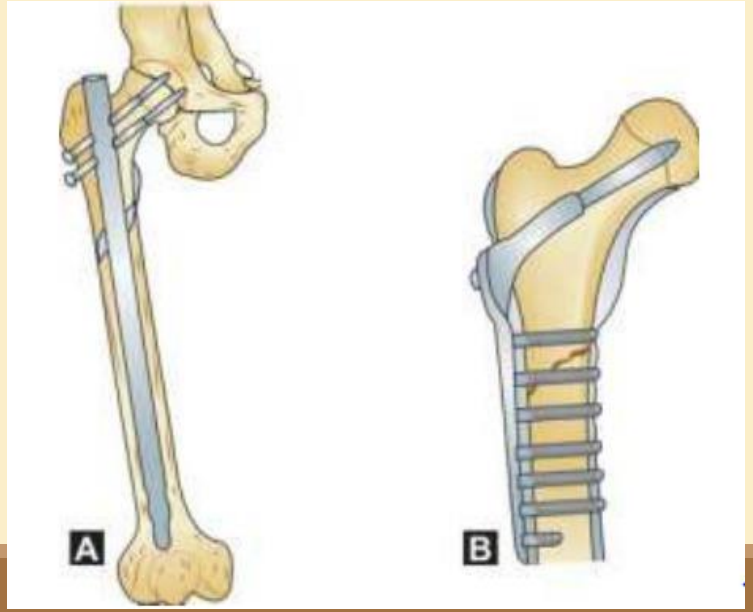
classification

The Fielding classification subdivides the fractures according to their anatomical location:

- type 1 fractures are those at the lesser trochanter level
- type 2 fractures are those located between 2.5 and 5 cm below the lesser trochanter
- type 3 fractures are those located between 5 and 7.5 cm below the lesser trochanter. Its value is only historical, due to its low reproducibility on account of ethnic variations.

Treatment

- **Conservative**: Methods are advocated if the patient is young. In severely comminuted fractures, modified cast brace with pelvic band is used.
- **Surgery**: ORIF is chosen in adults.



- fixation of pertrochanteric and subtrochanteric fractures: With the gamma nail, stable osteosynthesis of subtrochanteric and pertrochanteric fracture femur is obtained independently of the fracture classification. Patients can be mobilized immediately with this method.

Rehabilitation Objectives

- **Range of Motion** Improve and restore hip ROM (sitting in a chair requires 90 degrees of flexion). Maintain knee and ankle ROM.

Motion	Normal	Functional[a]
Flexion	125–128°	90–110°
Extension	0–20°	0–5°
Abduction	45–48°	0–20°
Adduction	40–45°	0–20°
Internal rotation	40–45°	0–20°
External rotation	45°	?0–15°

- **Muscle Strength**

Improve the strength of the following muscles:

- Quadriceps: knee extensors; especially the vastus lateralis, which is incised during surgery.
- The rectus femoris portion of the muscle is also a hip flexor.
- Hamstrings: knee flexor and secondary hip extensor.
- Gluteus medius: hip abductor.
- Gluteus maximus: hip extensor.
- Tensor fascia lata: hip external rotator and abductor.
- Adductor magnus: hip adductor. Do not strengthen this muscle because it stresses the fracture site and the implants.

- **Functional Goals:** Restore normal gait pattern and independent ambulation.

Physiotherapy treatment

Same as neck of femur fracture

LONG-TERM PROBLEMS

Orthopedic Considerations:

Nonunion is a rare occurrence, often associated with loss of fixation.

If nonunion occurs, it may be treated by restoring rigid fixation and bone grafting.

Rehabilitation Considerations:

- A shortened limb caused by bone loss, comminution, or impaction of the fracture may be treated with a shoe lift.
- Patients are often unsteady or have some imbalance from weakness. If this unsteadiness does not rapidly improve with strengthening and gait training, the patient may need to use a cane and a quad cane or walker might be needed.
- Antalgic gaits may also result from prominent and painful hardware.
- An abductor lurch gait may occur if the greater trochanter was fractured and displaced.

POSTERIOR DISLOCATION OF HIP JOINT

Definition

Posterior dislocation is common dislocation in hip joint (70%).

Traumatic posterior dislocation is usually a car dashboard injury or is due to fall of weight on the back of a stooping miner.

Mechanism of injury

- It is due to a backward directed force along the line of femur in a flexed hip.
- If the femur is more adducted at the time of impact, pure dislocation results
- If the femur is slightly abducted fracture dislocation results.

Clinical features

- Patient has a flexion, adduction and medial rotation deformity of the affected limb.
- Marked restriction of all hip movements.
- Head of the femur is felt as a hard mass in the glutei region and it moves along with the femur.
- Sciatic nerve palsy

Radiograph

Plain X-ray of the hip joint, the AP and lateral views, helps to make an accurate diagnosis.

Treatment

The physiotherapy management for the above injury proceeds more or less in the same lines as discussed for fracture neck of femur.

Thank you