



Hip fracture in young age

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A 14-year-old boy, with good past health presented with right hip contusion during ice-skating. He was unable to walk or stand after the injury. There was no associated injury and no external wound.

On arrival to the emergency department, his vitals were as follow:

- BP: 130/81mmHg, Pulse: 87 bpm
- RR: 16 breaths per minute, SpO2: 100% on room air
- GCS: E4V5M6, pupils: Equal and reactive

There was pain at his right hip on axial loading of the right femur. The active and passive range of movement of right hip was reduced. There was no foot drop or lower limbs weakness.

X-ray pelvis was taken and showed fracture neck of femur on right side. (Figure 1)



Figure 1: X-ray pelvis of the patient

How to classify hip fracture?

Hip fracture can be broadly classified into intra-capsular or extra-capsular (Figure 2 and table1). Extra-capsular fracture is defined as fracture extending from the extracapsular femoral neck to the area just distal to the lesser trochanter.

Intra-capsular fracture has a higher rate of non-union, mal-union and osteonecrosis of femoral head because the fracture may disrupt the blood supply to the femoral head.

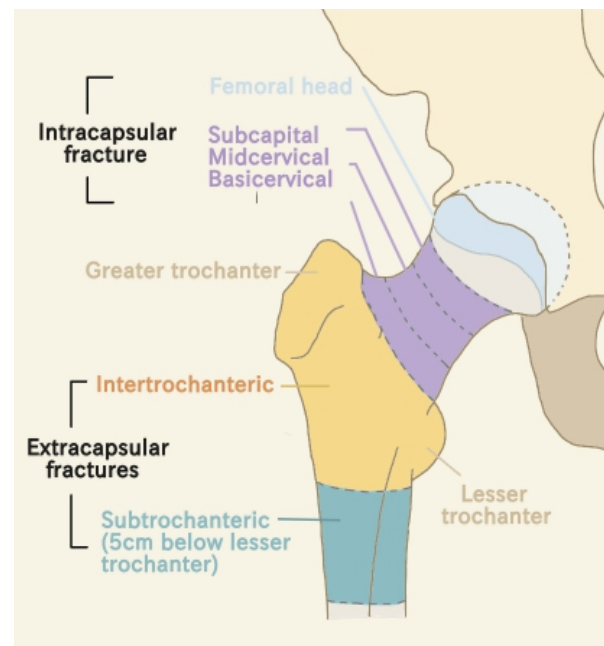


Figure 2: Types of hip fracture

For fracture neck of femur, we usually employ Garden Classification to grade the severity based on the radiographic features.¹ (Figure 3)

Table 1: Classification of hip fracture

Intra-capsular	Femoral head
	Fracture neck of femur
	- Subcapital - Midcervical - Basicervical
Extra-capsular	Inter-trochanteric fracture
	Sub-trochanteric fracture

Normally, the trabeculae of the acetabulum, the head and the neck of the femur are in alignment.

In type I fracture, the fracture is incomplete or impacted. The angle between the trabeculae of the head and neck of the femur is disturbed.

In type II fracture, the fracture is complete and non-displaced. Therefore, the alignment of the trabeculae of the head and the neck is maintained.

In type III fracture, the fracture is minimally displaced. The femoral head is still connected with the shaft by retinacular attachment. So the trabeculae of the femoral head will not completely align with those of the acetabulum. The trabeculae line between the head and the neck is disturbed as well.

In type IV fracture, the femoral head is completely displaced from the shaft. The head is

free to realign itself, so the trabeculae of the femoral head will align with those of the acetabulum while those between the head and the neck is not aligned.

What is the blood supply of the femoral head?

The blood supply to the femoral head is tenuous. It is achieved through an anastomosis of three sets of arteries. (Figure 4)

1. Extra-capsular arterial ring at the base of the femoral neck.
It is formed primarily from the medial circumflex femoral artery (MFCA) and, to a lesser extent, the lateral circumflex femoral artery (LFCA). It give rise to ascending cervical branches or retinacular arteries which penetrate the capsule.
2. Terminal branches of the medullary artery from the shaft of the femur
3. The foveal artery (a branch of obturator artery) via the ligamentous teres. It is the smallest and most variable contributor to blood supply in adult femoral head

Fracture of the neck of femur can disrupt the blood supply to the femoral head leading to osteonecrosis.

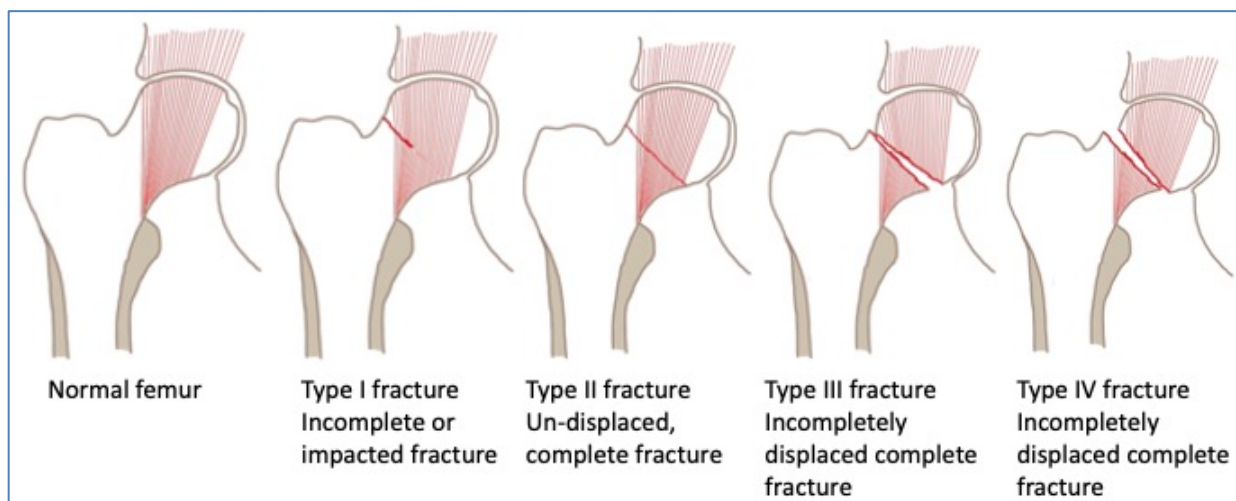


Figure 3 Garden classification for fracture neck of femur

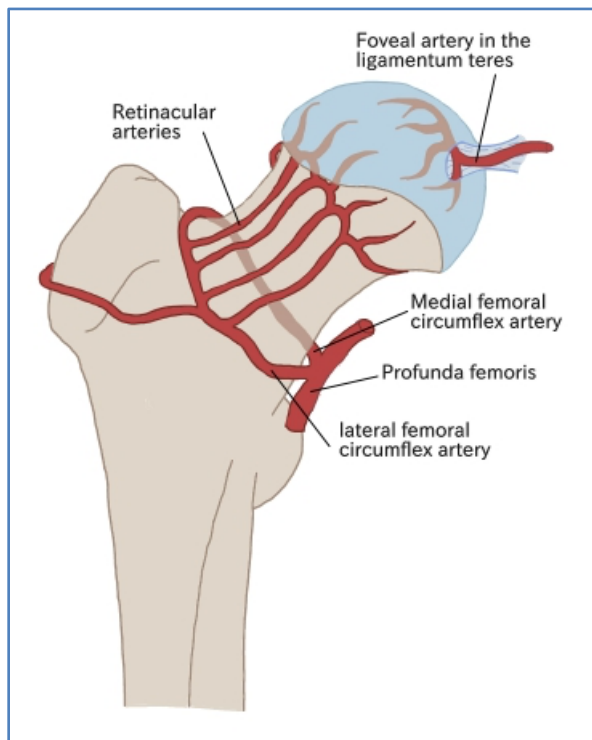


Figure 4: Blood supply to the femoral head

Is it common for patients with fracture hip present with shock?

Fracture neck of femur itself seldom leads to shock. The blood loss associated with a hip fracture has been quantified by Kumar.² The drop in haemoglobin concentration is showed in table 2.

Table 2: Drop in Hb associated with hip fracture

Type of fracture	Hb concentration drop
Intra-capsular	0.7g/dL
Intertrochanteric	1.1g/dL
Subtrochanteric	2.23g/dL

The patient is young, what is the principle of management?

Unlike such fracture in geriatric population, fracture hip in young patient often resulted from high-energy trauma with multiple systems involvement. We should actively look for other life-threatening conditions e.g. head, chest or abdominal trauma, with simultaneous treatment.

Most femoral neck fracture requires surgical fixation. In general, non-displaced fractures are treated with screw fixation and displaced fractures are treated with arthroplasty.

For young patients, the activity level and functional demand is high. Therefore, preservation of the natural hip anatomy, minimizing the risk of non-union and osteonecrosis are important. Therefore, instead of arthroplasty, early anatomic reduction and internal fixation are recommended.

Timing of surgical intervention

Timing of operation may have an impact on patient outcome.³ Bone healing depends on restoration of anatomical alignment, preservation of blood supply to both the bone and the surrounding tissue and stability of fixation.

Delay in operation will result in delayed functional recovery and full weightbearing status. Prolonged bed rest may increase the risk of complication like pressure ulcer, deep vein thrombosis, pneumonia and urinary tract infection.

Therefore, for stable patient without comorbidity, operation should be performed within 24 hours.⁴ For patients with significant comorbidity, we should try to optimize the medical condition before operation and avoid delaying the operation beyond 72 hours.

Progress of patient

The patient was admitted to the orthopaedic ward. Close reduction with internal screw fixation of left hip was performed urgently.

The x-ray of the pelvis after the operation was shown (Figure 5). Three parallel cancellous lag screws oriented along the femoral neck were inserted.

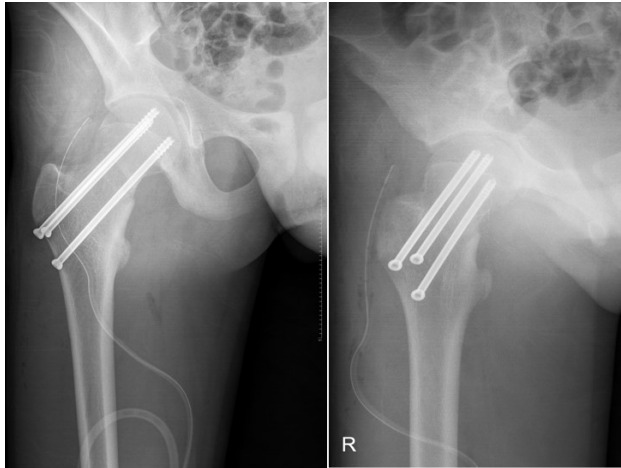


Figure 5: Post-op x-ray of right hip

What delayed complications do we need to look for in this patient?

Femoral neck fractures have a relatively high rate of complications compared to extracapsular hip fractures.

Potential complications following surgical repair include infection, chronic pain, dislocation, non-union, avascular necrosis (AVN), and post-traumatic arthritic changes.

Non-union

Non-union occurs in 4-30% of patients.⁵ It usually presents as persistent groin, hip or thigh pain aggravated by weight bearing. Symptoms usually occur several months after the operation.

Factors associated with non-union include:

- Increasing patient age
- Initial fracture displacement
- Degree of comminution
- Quality of reduction

Avascular necrosis

Avascular necrosis of the femoral head (osteonecrosis) occurs in about 14.3%.⁶ The underlying pathophysiology is related to the

direct disruption of the intra-capsular arteries during the primary injury and the elevated intra-capsular pressure related to haemarthrosis.^{7,8}

Symptoms are similar to those of non-union but most patients present within 2 years of operation. Therefore, patients should be followed up at least for 3 years following surgery.

Factors associated with osteonecrosis include:

- Age at the time of injury (Younger patients develop more osteonecrosis)
- Degree of displacement
- Quality of reduction
- Implant removal
- Presence of comminution

Progress of patient

After the operation, the patient received physiotherapy with toe touch down walking exercise. He was discharged on day 5.

X-ray at 6 weeks after the injury showed that the alignment was maintained and the fracture was healing with callus formation. There was no feature suggestive of avascular necrosis. (Figure 6)

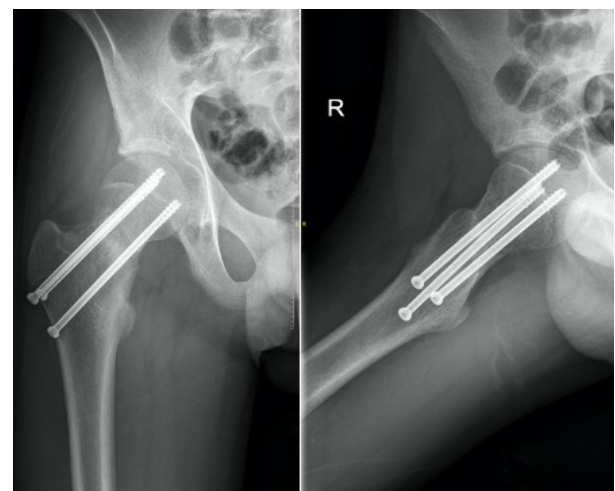


Figure 6: X-ray of right hip at 6 weeks after the injury

Reference

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