

Department of Radiology Techniques

Radiological Position

The Second Stage

Semester 2



*Positions of Knee Joint and Patella*

*Lecture 7*

*Assist. Lecturer*

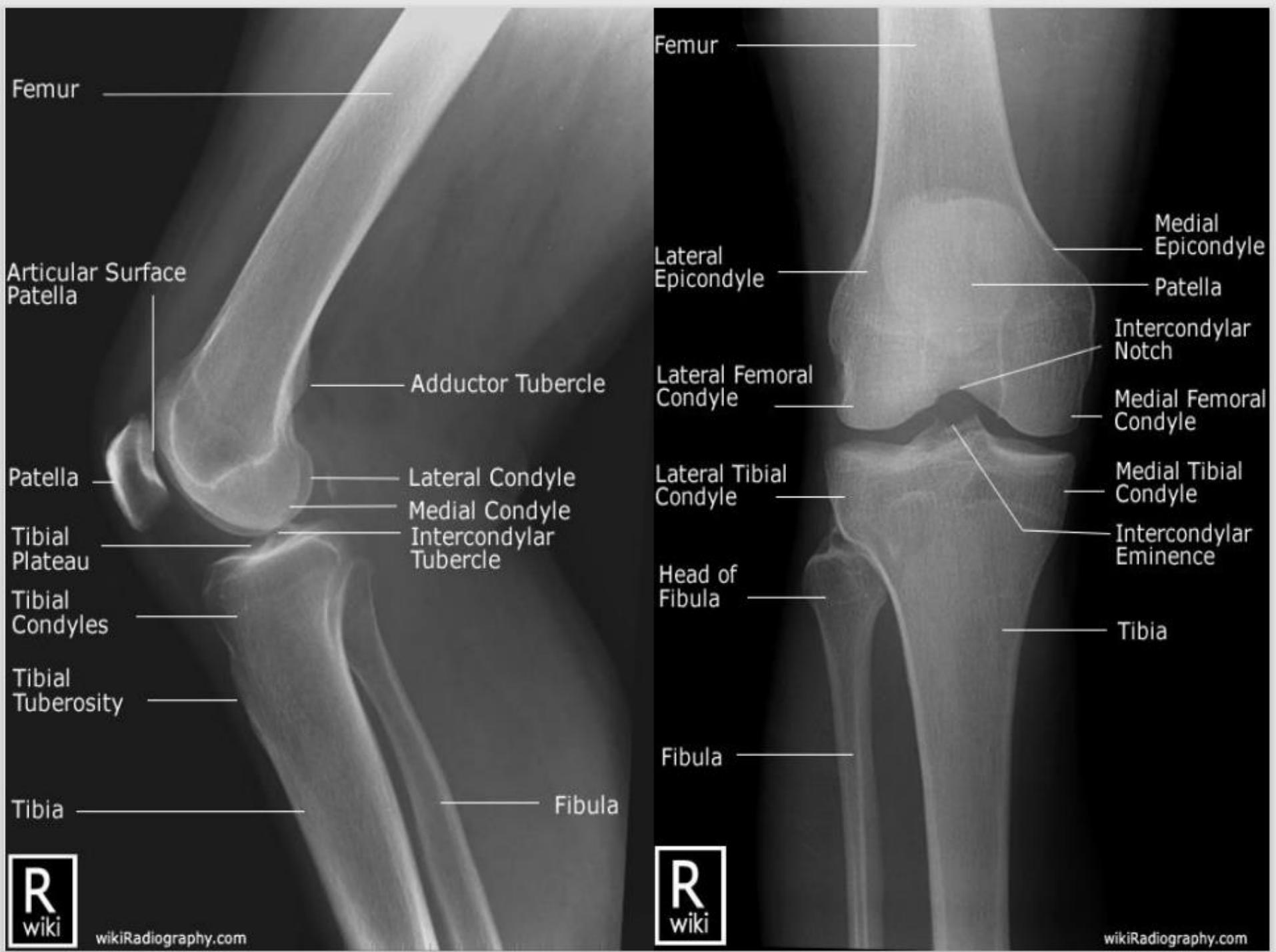
*Tariq Nadhim Jassim*

# *Basic Positions of Knee Joint*

*1- Anterior – Posterior*

*2- Lateral*

*Cassette out – Bucky (10x12 Inch)*



# **1- Anterior – Posterior**

## ***Position of Patient***

The patient is either supine or seated on the X-ray table, with both legs extended. The affected limb is rotated to centralize the patella between the femoral condyles, and sandbags are placed against the ankle to help maintain this position.

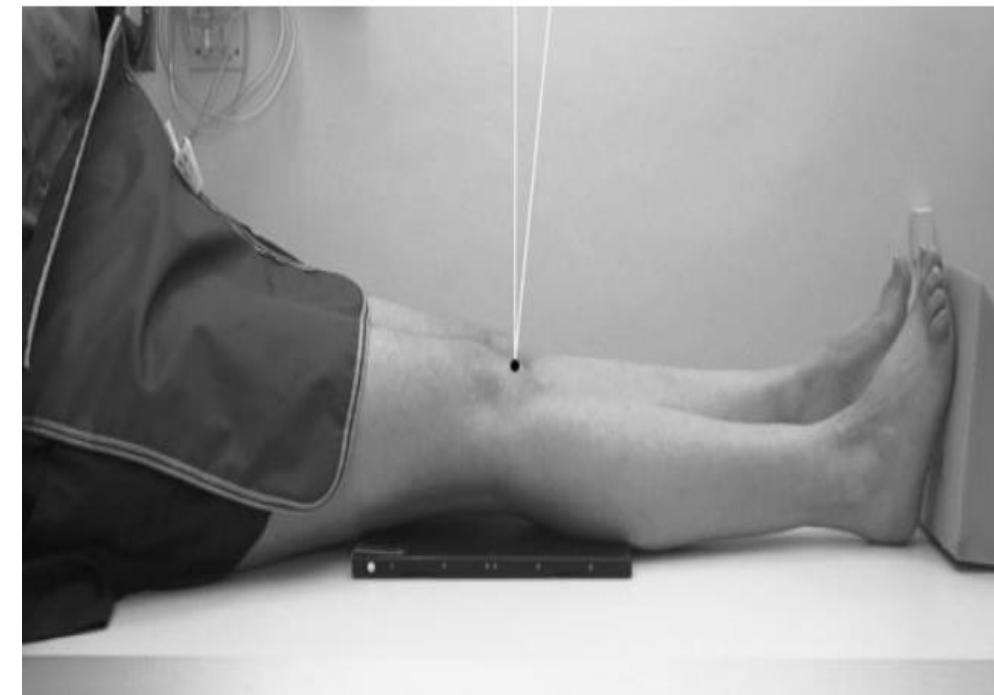
- The cassette should be in close contact with the posterior aspect of the knee joint, with its center level with the upper borders of the tibial condyles.

## ***Direction and centering of the X-ray beam***

- Centre 2.5 cm below the apex of the patella through the joint space.

## ***Essential image characteristics***

- The patella must be centralized over the femur.



Normal antero-posterior radiograph

## **2- *Lateral***

### ***Position of Patient***

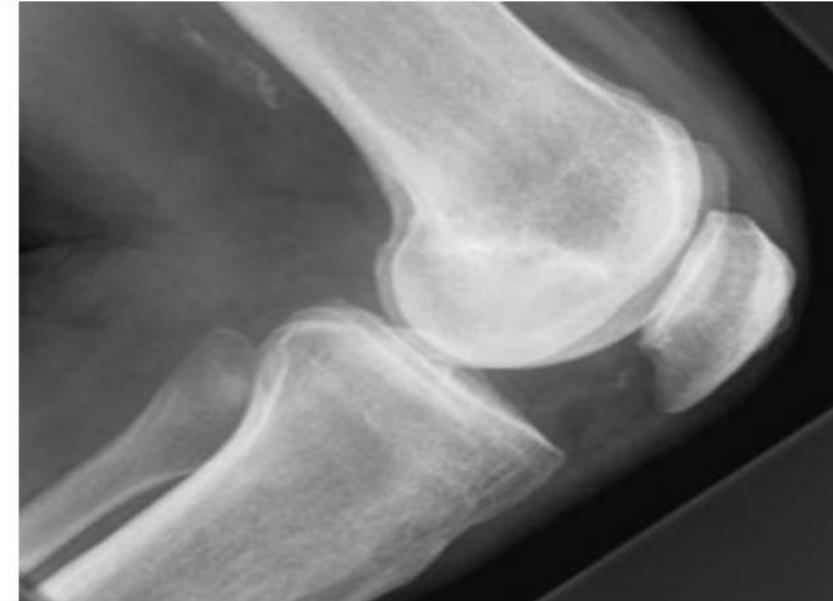
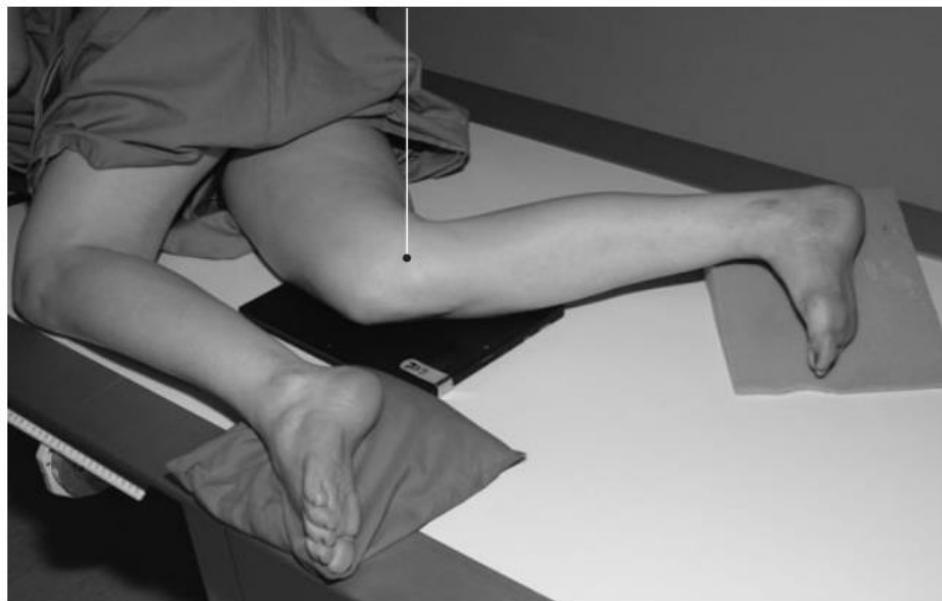
- The patient lies on the side to be examined, with the knee flexed at 45 or 90 degrees (see below).
- The other limb is brought forward in front of the one being examined and supported on a sandbag.
- A sandbag is placed under the ankle of the affected side to bring the long axis of the tibia parallel to the cassette.
- The position of the limb is now adjusted to ensure that the femoral condyles are superimposed vertically.
- The center of the cassette is placed level with the medial tibial condyle.

## ***Direction and centering of the X-ray beam***

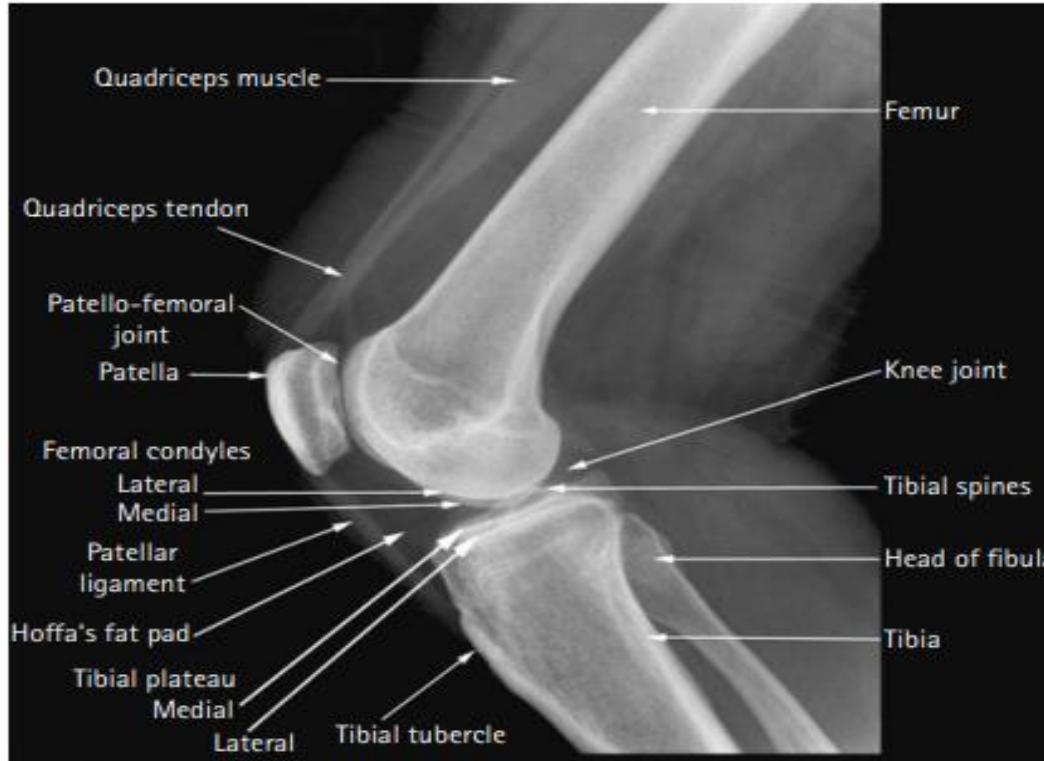
- Centre to the middle of the superior border of the medial tibial condyle, with the central ray at 90 degrees to the long axis of the tibia..

## ***Image Characteristics***

- The patella should be projected clear of the femur.
- The femoral condyles should be superimposed.
- The proximal tibio-fibular joint is not clearly visible.



Lateral radiograph of the knee with 90 degrees of flexion



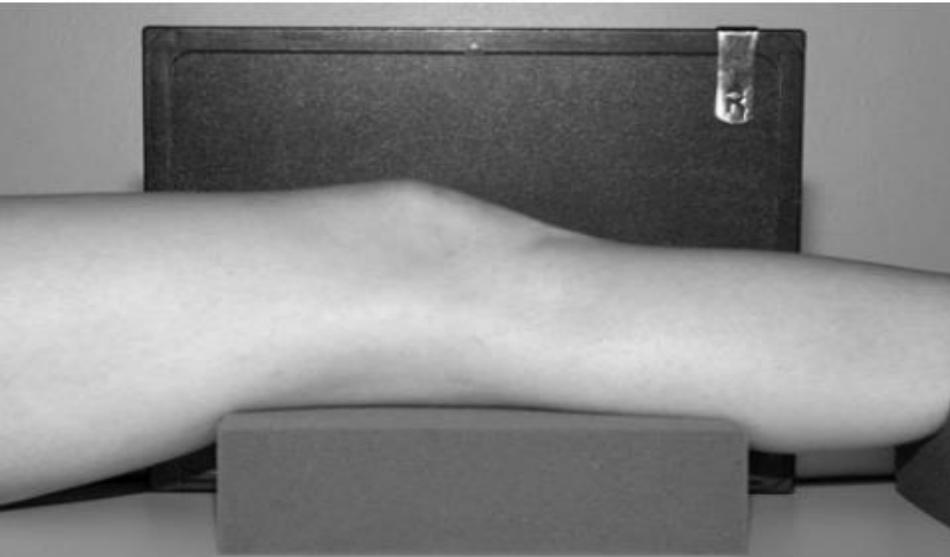
Lateral radiograph of the knee with 45 degrees of flexion



Effect of over rotation



Effect of under rotation



Horizontal beam lateral showing distal femoral fracture



Horizontal beam lateral showing depressed fracture of tibial plateau (arrows) and lipohaemarthrosis (arrowheads)



Horizontal beam lateral showing transverse fracture of the patella and joint effusion in suprapatellar bursa (arrows)

# **1- Anterior – Posterior (standing projection)**

*This projection is useful to demonstrate alignment of the femur and tibia in the investigation of valgus (bow leg) or varus (knock knee) deformity. Any such deformity will be accentuated when weight bearing, which more closely resembles the real-life situation. It is commonly requested to assess alignment prior to joint replacement, as narrowing of one side to the joint space more than the other will produce varus or valgus tilt. Both knees may be included for comparison.*

## ***Position of Patient***

- The cassette is supported in the chest stand.
- The patient stands with their back against the vertical Bucky for support if necessary.
- The patient's weight is distributed equally.
- The knee is rotated so that the patella lies equally between the femoral condyles.
- The centre of the cassette is level with the palpable upper borders of tibial condyles.

## *Direction and centering of the X-ray beam*

- Center to midway between palp-able upper borders of the tibial condyles.



Standing antero-posterior knee radiograph showing loss of height of the medial compartment due to osteoarthritis

# *Positions of patella*

*1- Posterior -Anterior*

*2- Skyline projections there are **three** methods :*

- *conventional infero-superior;*
- *supero-inferior – beam directed downwards;*
- *infero-superior – patient prone.*

*Cassette out – Bucky (8x10 Inch)*

## **1- Posterior-Anterior**

### **Position of patient and cassette**

- *The patient lies prone on the table, with the knee slightly flexed.*
- *Foam pads are placed under the ankle and thigh for support.*
- *The limb is rotated to centralize the patella.*
- *The center of the cassette is level with the crease of the knee.*

### **Direction and centering of the X-ray beam**

- *Centre to midway between the upper borders of the tibial condyles at the level of the crease of the knee, with the central ray at 90 degrees to the long axis of the tibia.*
- *The beam may have to be angled caudally to be at right angles to the long axis of the tibia*



Postero-anterior radiograph of normal patella



Radiograph of patella showing transverse fracture

# ***Skyline Projections***

*The skyline projection can be used to:*

- *assess the retro-patellar joint space for degenerative disease;*
- *determine the degree of any lateral patella subluxation with ligament laxity.*
- *diagnose chondromalacia patellae;*
- *confirm the presence of a vertical patella fracture in acute trauma.*

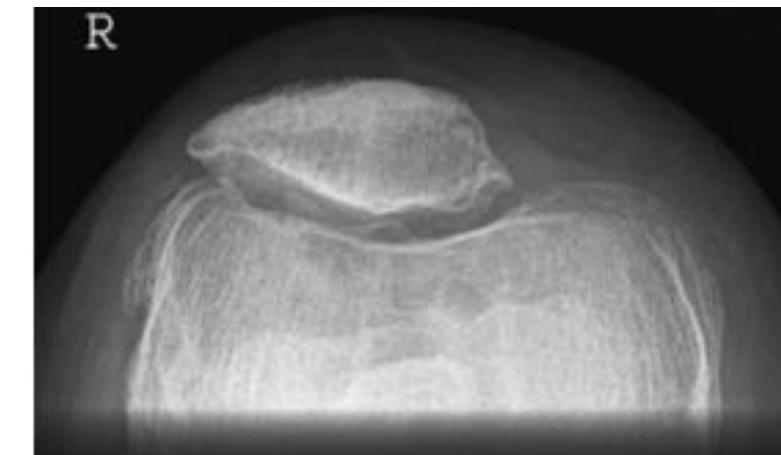
## ***1- Conventional Inferior-Superior projection***

***Position of patient and cassette***

- *The patient sits on the X-ray table, with the knee flexed 30–45 degrees and supported on a pad placed below the knee.*
- *A cassette is held by the patient against the anterior distal femur and supported using a non-opaque pad, which rests on the anterior aspect of thigh.*

## **Direction and centering of the X-ray beam**

- The tube is lowered. Avoiding the feet, the central ray is directed cranially to pass through the apex of the patella parallel to the long axis.
- The beam should be closely collimated to the patella and femoral condyles to limit scattered radiation to the trunk and head.



Conventional infero-superior projection showing osteophytosis affecting the retro-patellar joint



Thirty-degree flexion



Sixty-degree flexion  
Infero-superior (conventional) projection

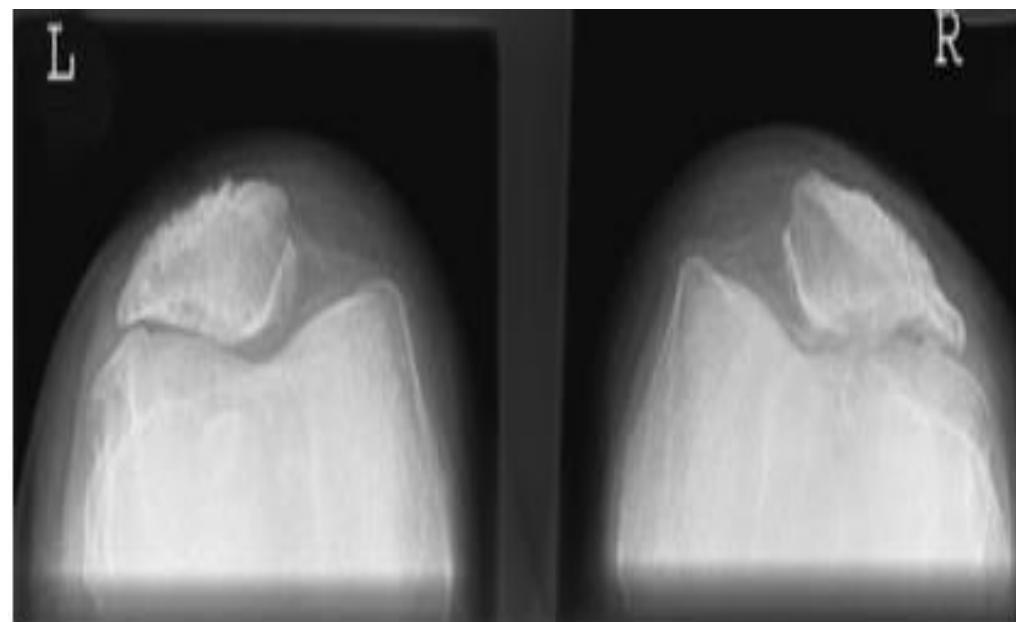
## **2- Superior-Inferior**

### ***Position of patient and cassette***

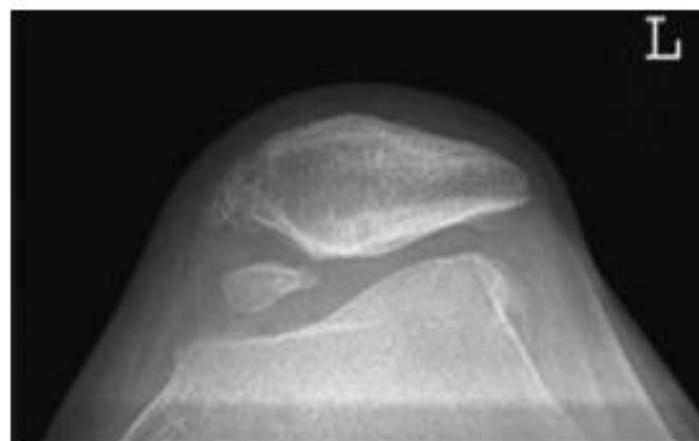
- The patient sits on the X-ray table, with the affected knee flexed over the side.
- Ideally, the leg should be flexed to 45 degrees to reflect a similar knee position to conventional skyline projection. Too much flexion reduces the retro-patellar spacing. Sitting the patient on a cushion helps to achieve the optimum position.
- The cassette is supported horizontally on a stool at the level of the inferior tibial tuberosity border.

### ***Direction and centering of the X-ray beam***

- The vertical beam is directed to the posterior aspect of the proximal border of the patella. The central ray should be parallel to the long axis of the patella.
- The beam is collimated to the patella and femoral condyles.



Supero-inferior projections showing advanced degenerative changes but the knees have been flexed too much, giving the appearance of lateral subluxation of the patella



Supero-inferior image showing some degenerative changes and a loose bone fragment

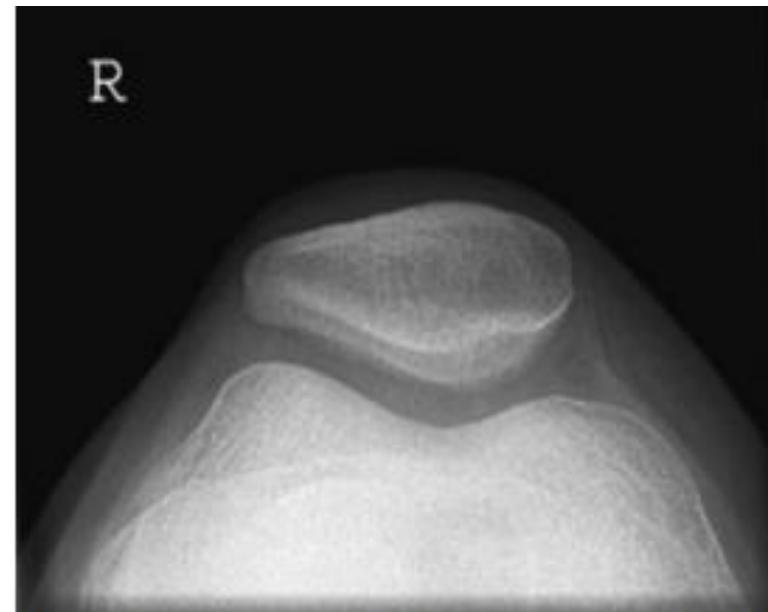
### **3- Inferior-Superior – Patient Prone**

#### ***Position of patient and cassette***

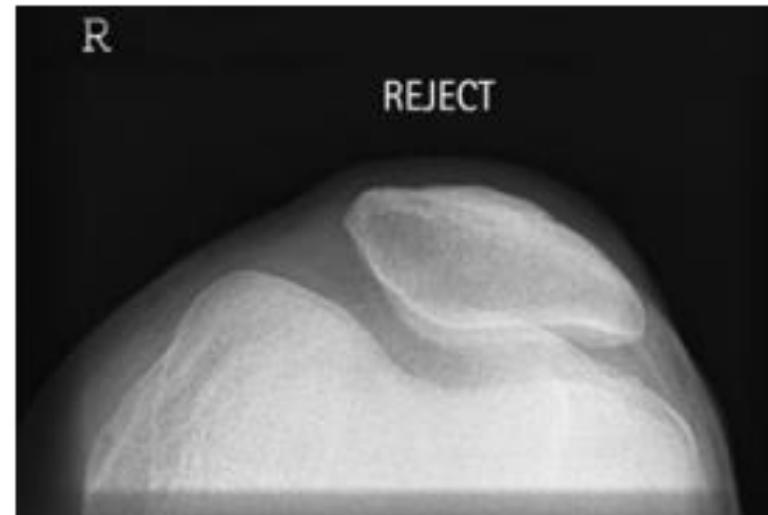
- *The patient lies prone on the X-ray table, with the cassette placed under the knee joint and the knee flexed through 90 degrees.*
- *A bandage placed around the ankle and either tethered to vertical support or held by the patient may prevent unnecessary movement.*

#### ***Direction and centering of the X-ray beam***

- *Centre behind the patella, with the vertical central ray angled approximately 15 degrees towards the knee, avoiding the toes.*



Normal infero-superior radiograph of patella, patient prone



Infero-superior radiograph with insufficient flexion causing the tibia to be projected over the patella

thanks