Sample technique notes:

Region: The Knee

Basic Anatomy

The knee joint is a synovial condylar joint.

The articular surfaces involved are the lateral and medial condyles of the femur superiorly, which articulate with the lateral and medial condyles of the tibia and the semilunar curtilages inferiorly, in addition the patella articulates with the lower end of the femur.

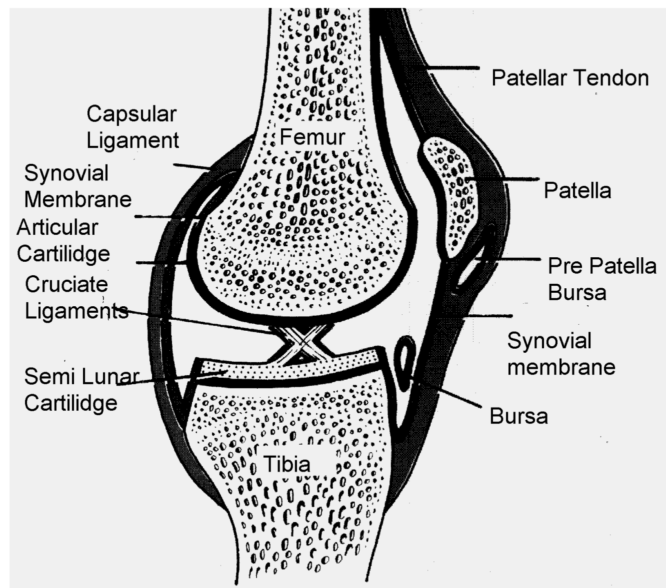


Diagram to demonstrate principle Anatomy of the Lt. Knee (Lateral.)

The following ligaments are involved in the knee joint,

Fibrous capsule, ligamentum patella, oblique ligaments, cruciate ligaments and the transverse ligament.

The synovial membrane of the knee joint is extensive, extending from the upper border of the patella forming a pouch, the supra patella bursa which extends from the lower end of the femur anteriorly to the quadriceps femoris muscle. Lateraly the synovial membrane passes inferiorly on the inside of the capsule to the menisci, posteriorly the synovial membrane is reflected forwards to cover the cruciate ligaments.

The semi lunar cartilages or menisci are two crescent shaped cartilages lying between the femur and the tibia.

Bursae, the three principle bursae are the supra patella bursa, the pre patella bursa and the infra patella bursa.

Blood supply and Venous drainage

The popliteal artery and the anterior tibial arteries which are branches of the femoral artery,

Nerve supply.

Branches of the femoral nerve, obturator nerve and the medial and lateral popliteal nerves.

Movements.

Flexion involving hamstring, gastronemius and sartorius muscles.

Extension by the quadriceps femoris muscle.

Medial rotation and lateral rotation only occur when there is some degree of flexion.

Relations of the knee joint.

Anteriorly: the quadriceps femoris and the patella.
Posteriorly: popliteal vessels and nerves.
Superiorly: Femur.
Inferiorly: Tibia and fibula.

Radiographic Technique

Indications, e.g.

Trauma, fractures, joint disruptions meniscal tears.
Infection, T.B.
Joint degeneration, oseteo arthritis and rheumatoid arthritis.
Pathologies, osteo-chondritis of the tibial tubercle (Osgood Schlatters disease), bursitis.
Tumours. Osteo-sarcoma.

Contra Indications

Non Specific unless an alternative imaging modality would be more appropriate.

Patient Preparation

General psychology, remove any clothing bandages or splints where possible.

Immobilisation

Non specific, sandbags and pads may help in some cases.

Accessories

Sandbags, cassette holder, foam pads, beam limitation cones.

Radiation Protection

Direct lead rubber gonad protection.

Equipment Choice

Ceiling mounted tube assembly
Medium powered generator

Aftercare

Ensure any clothing and splints / bandages are replaced.
Ensure patient knows where to receive the results.

Basic Projection:

AP, Lateral and horizontal ray lateral

Additional projections

Medial and lateral obliques, patella projections, flexion and extension, weight bearing.

Additional modalities

Ultrasound for bursitis.
CT ?
MRI for internal joint structures.
Flourography and arthrography

Basic Projections

AP Knee

Structures demonstrated

Distal femur, proximal tibia and fibula, patella and joint space and surfaces.

Patient Position

The patient sits supine on the table legs extended with the affected leg in line with the long axis of the table.

Part position

The joint is positioned so that the apex of the patella is midway between the femoral condyles, if the patella is absent the femoral condyles are positioned equidistant from the film, in general this requires the whole leg to rotated medially approx. 5^{0}.

Central Ray

The vertical central ray is centred midway between the femoral condyles at the level of the palpable joint space. In cases where the leg is not fully extended ensure the central ray is at 90^{0} to the shaft of the tibia.

Collimation

Laterally to the skin margins, Superiorly and inferiorly to the cassette.

Exposure Factors

Kv		mAS		FFD(cm)	Focus	Grid?	Film/Screen
70		3		100	Fine	No	Detail

Film Evaluation.

Identification.

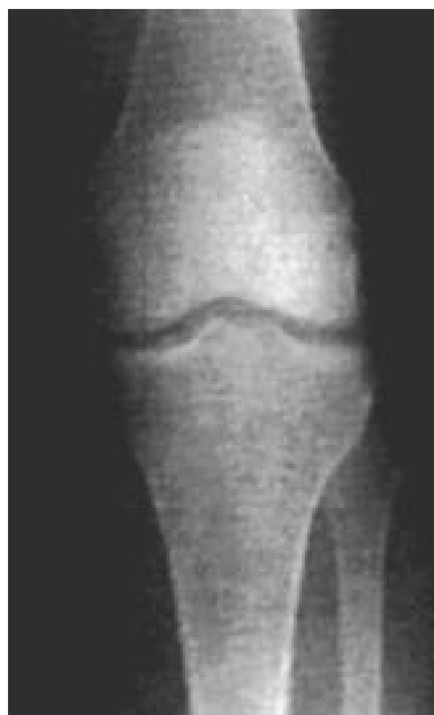
Patient's name, date, hospital, examination number and anatomical marker.

Limits of Examination.

Superiorly lower 1/3 of femur, Inferiorly upper ¼ tibia and fibula.
Lateraly the skin margins.

Exposure.

Penetration, ensure most dense structures i.e. lower end of femur is adequately penetrated i.e. bone trabeculae are visible.
Contrast, ensure soft tissues and bone structures are visible.
Density, ensure all structures are visible on a normal viewing box.



AP radiograph of Left Knee.
(Note no marker or ID.)

Projection.

Positioning.

Long axis of lower limb is in the centre of the exposed area,
Tibial femoral joint space is visualised.
Tibial spines are centred between femoral condyles and in line with apex of patella,
Medial half of the head of fibula overlaid by medial tibial condyle.

Central ray.

At 90^{0} to tibia, tibial femoral joint space is visualised.
Centred to joint space, equal collimation above and below joint space.