Al-Mustaqbal University
College of Health and Medical Technologies
Radiological Techniques Department

Magnetic Resonance Imaging

First Semester

Lecture 26 : MRI of Knee joint

By

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Introduction :

Magnetic resonance imaging (MRI) has become the preferred modality for imaging **the knee to show pathology and guide patient management and treatment. The knee is one of the most frequently injured joints, and knee pain is a pervasive difficulty that can affect all age groups. Due to the diverse pathology, complex anatomy, and a myriad of injury mechanisms of the knee**, the MRI knee protocol and sequences should ensure **detection of both soft tissue and osseous structures in detail and with accuracy**. The knowledge of knee anatomy and the normal or injured MRI appearance of these key structures are critical for precise diagnosis.

•Anatomical overview:

The knee joint is a **hinge type synovial joint**, which mainly allows for **flexion and extension** (and a small degree of medial and lateral rotation). It is formed by articulations between **the patella, femur and tibia**. (fig.1)

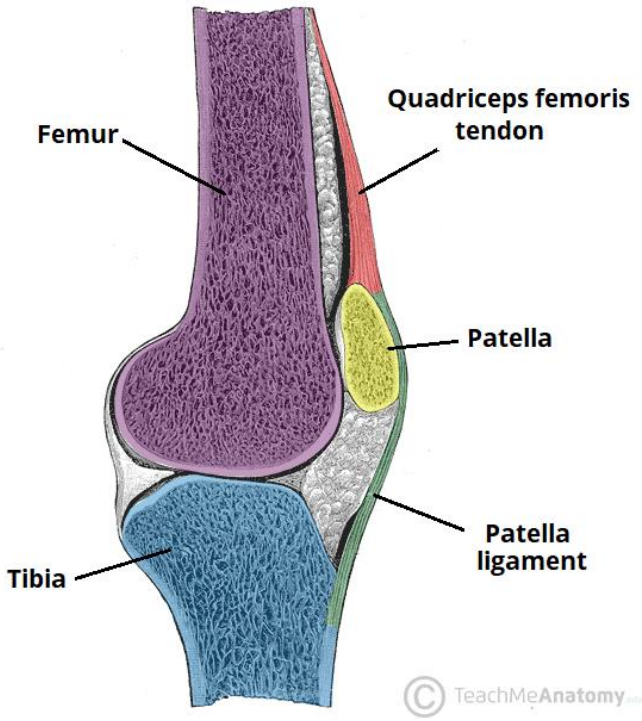


Fig 1 The femur, tibia and patella of the knee joint.

•MRI knee protocol comprises a group of MRI sequences to routinely assess the knee for internal pathologies such as meniscal, ligament and cartilage injury.

•Indications:

1-Disruption of knee ligaments, i.e. anterior or posterior cruciate ligaments (ACL or PCL), medial or lateral collateral ligaments (MCL or LCL).

2- Patellofemoral disease.

3- Osteonecrosis.

4-Mass, e.g. giant cell tumor.

5-Arthritis (OA or RA).

Osteoarthritis

Imaging Findings:

- Joint space narrowing.
- Osteophyte formation
- Subchondral sclerosis

Rheumatoid Arthritis (RA)

Imaging Findings:

- Joint erosions and deformities.
- Soft tissue swelling.
- Bone density changes due to inflammation.

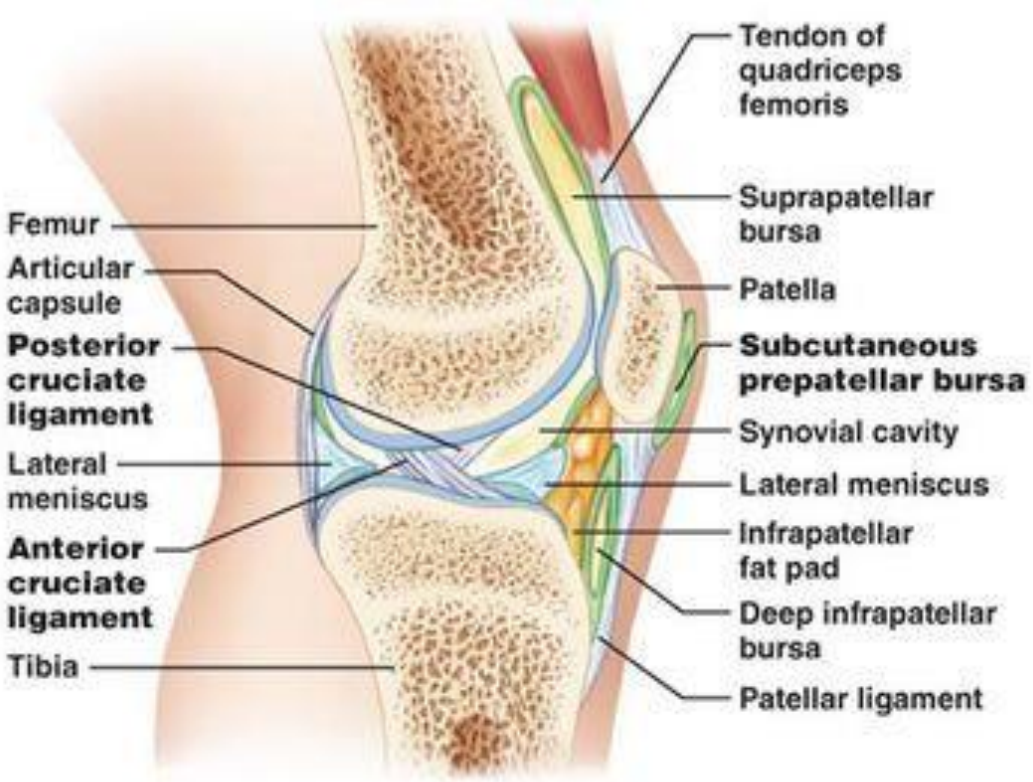
•MRI procedures:

•Patient position:

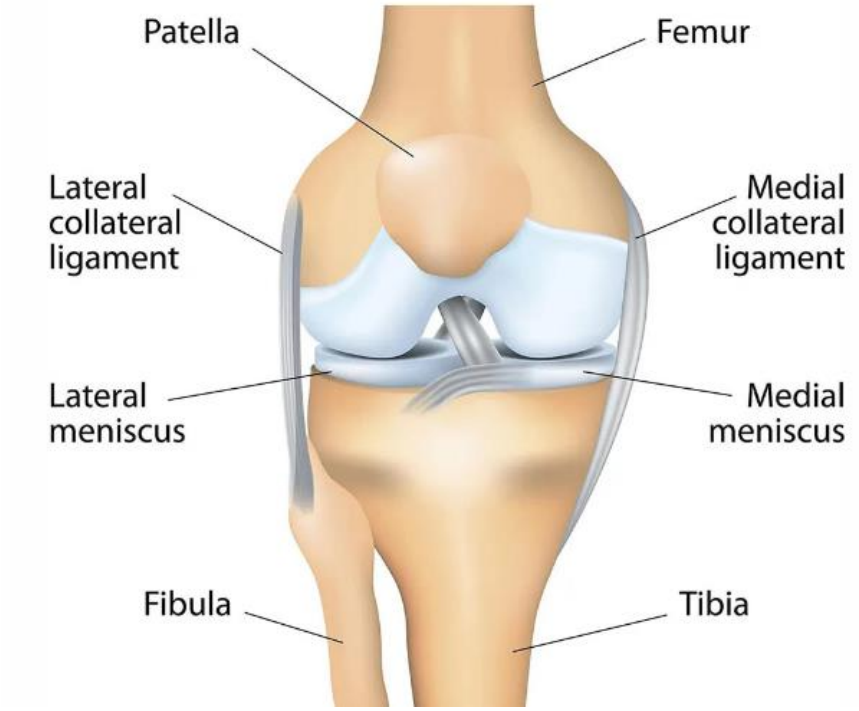
1- Patient should be in supine position, feet first, with knee positioned in the coil **(extremity coil)** as close to the isocenter as possible.

2- Surround the knee with sponges, cushion under heel, and support the lower leg and ankle. (fig.2)

Fig.2 Patient position (knee joint MRI)



(a) Sagittal section through the right knee joint



• Scout slice placement:

1-Sagittal localizer for axial slice

-Slice Acquisition: Superior To Inferior.

- Slice Alignment: Parallel To The Tibial Plateau.

- Anatomic Coverage: From above the patella through the tibial tuberosity and the patella tendon insertion.

2-Coronal localizer for sagittal slice

-Slice Acquisition: Medial To Lateral.

- Slice Alignment: Parallel To The Anterior Cruciate Ligament.

-Anatomic Coverage: From the medial condyle of the femur to the lateral condyle of the femur.

3-Sagittal localizer for coronal slice

-Slice Acquisition: Anterior to posterior.

-Slice Alignment: Parallel to the posterior margins of the femoral condyles.

Anatomic Coverage: From the patella through the femoral condyles.

•MRI Sequences:

Sequence	TR	TE	FA	ETL	Slice thickness
PD (FS) (FSE) (sag, cor, and axial)	3000	20-40	-	10	3.5
Sagittal (T1) (FSE)	600	Min	-	4	3.5
Sagittal (T2WI) (FSE)	5075	85	-	16	3.5