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Q1:- What you know about MRI Brain, Important Sequences and procedure:-

Ans:- MRI Brain are cross sectional images of brain which are based on computer - these computer based images provide anatomical and physiological information about brain non invasively -

⇒ Brain are the most frequent imaged organ by MRI.

MRI Brain image consist of computer design,

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and hardware development.  
⇒ MRI Brain does not  
use ionizing radiation  
for the imaging Brain  
anatomy - thus it is  
a safe and painless  
Method to provide Brain

Imaging -  
⇒ MRI Scan can performed  
in any imaging plane  
without having physical movement  
to the patient -

## Indication:-

- ⇒ Ischemic Attack
- ⇒ Infection, inflammation
- ⇒ Trauma
- ⇒ Seizure
- ⇒ Infarction
- ⇒ Hemorrhage
- ⇒ UN Explained Neurological symptoms
- ⇒ Loss of Hearing

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→ Brain Tumors

→ vascular pathology

→ Congenital abnormality:-

## Patient preparation:-

⇒ Before preparation a complete history should check

- All Metallic object should be removed

- The patient should be instructed to avoid movement and coughing

- Disposable Ear plug should be provided to the patient to avoid noise-

## Contrast Agent:-

⇒ Gadolinium based Contrast is used for the Enhancement-

⇒ IV Gadolinium

⇒ rate of 1ml/Sec

⇒ slow infusion 1ml/10Sec

## Procedure:-

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⇒ Starting the procedure first we do —

## Patient positioning:-

- ⇒ The patient should be positioned supine with head first
- ⇒ Landmark Centre the FOV on the nasion in Midline
- ⇒ A Head coil is used first to position the patient.

## Brain protocol:-

Some of the routine sequence which is used for the brain imaging are →

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Sequences:-

⇒ Scout: 3 plane localiser

⇒ T<sub>2</sub> TSE in Axial plane

⇒ T<sub>2</sub> FLAIR Axial

⇒ T<sub>1</sub> SE Coronal

① localiser:-

A 3 plane localiser must be taken in the beginning, the localiser sequence are less than 25 second-

⇒ T<sub>2</sub> TSE Axial:-

Plane the axial slice on sagittal plane, slice must sufficient to cover the whole brain from vertex to the line of foramen magnum.

⇒ T<sub>2</sub> FLAIR Axial:-

In this sequence we also do the same as T<sub>2</sub> Axial but must take care of slice to cover the whole brain.

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Q2:- Indication and Contraindication  
for MRI Liver, liver anatomy  
(diagramm)

Ans:- Introduction :-

MRI is one the most useful and rapidly developing diagnostic tools for the evaluation of liver pathologies. MRI allows acquisition of images with excellent tissue contrast and anatomical detail. It is particularly good at visualising liver tissue and a capable of detection and characterisation of focal liver lesions. The success of liver imaging mainly depends upon technique and optimization of pulse sequence. Fast breath hold  $T_1$  and  $T_2$  sequences with smaller slice thickness and high resolution matrix are routinely used for liver imaging. Contrast enhanced  $T_1$  weighted scans play a main role in liver imaging.

# => Intra cellular agent :-

## Indication :-

- \* Liver Cirrhosis or Chronic hepatitis B: detect new nodules and follow
- Seen only in HBP.
- \* FNH vs HCA.
- \* pre-hepatectomy planning: Number and location of metastases to liver.
- \* Post-hepatectomy patients looking for a new metastases in remaining liver.
- \* Liver donor planning: biliary anatomy on HBP images.
- \* High suspicion of liver metastases occur on other imaging modalities.
- \* Questionable liver lesion on prior imaging with ECA: read or not.
- \* Bile leak/Biloma assess for site of leak.

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⇒ Extra cellular agent :-

Indication :-

- \* Liver Cirrhosis or Chronic hepatitis B: Characterize wash out and capsule appearance in LR-3 and LR-4 Observations detected at CT or Eovist MRI
- \* Characterization of liver lesion detected at US/CT (exception): FNH - Vs HCA
- \* Confirm hemangioma.
- \* Routine metastasis staging and follow up in patient not being considered for hepatectomy.
- \* Cholangiocarcinoma.
- \* Infiltrative HCC or vasculo-invasive HCC
- \* Elevated Total Bilirubin > 3.5.
- \* Iron overload / hemochromatosis / hemosiderosis.
- \* Prior Eovist: MRI showed poor liver up take on HBP images
- \* Main indication is evaluation of arterial anatomy, vascular patency.



## ⇒ Primary Indication :-

- \* Detection of focal hepatic lesions
- \* Lesion characterization, i.e. Cyst, focal fat, hemangioma, hepatocellular carcinoma, metastasis, focal nodular hyperplasia, hepatic adenoma.
- \* Evaluation for known or suspected metastasis.
- \* Evaluation of vascular patency.
- \* Evaluation of diffuse liver disease such as hemochromatosis, hemosiderosis, fatty infiltration.
- \* Evaluation of cirrhotic liver
- \* Clarification of finding from other imaging studies or laboratory abnormalities.

## ⇒ Extended Indication :-

- \* potential liver donor evaluation.
- \* Evaluation of tumor response to treatment, e.g. Image-guided liver interventions / tumor ablation.

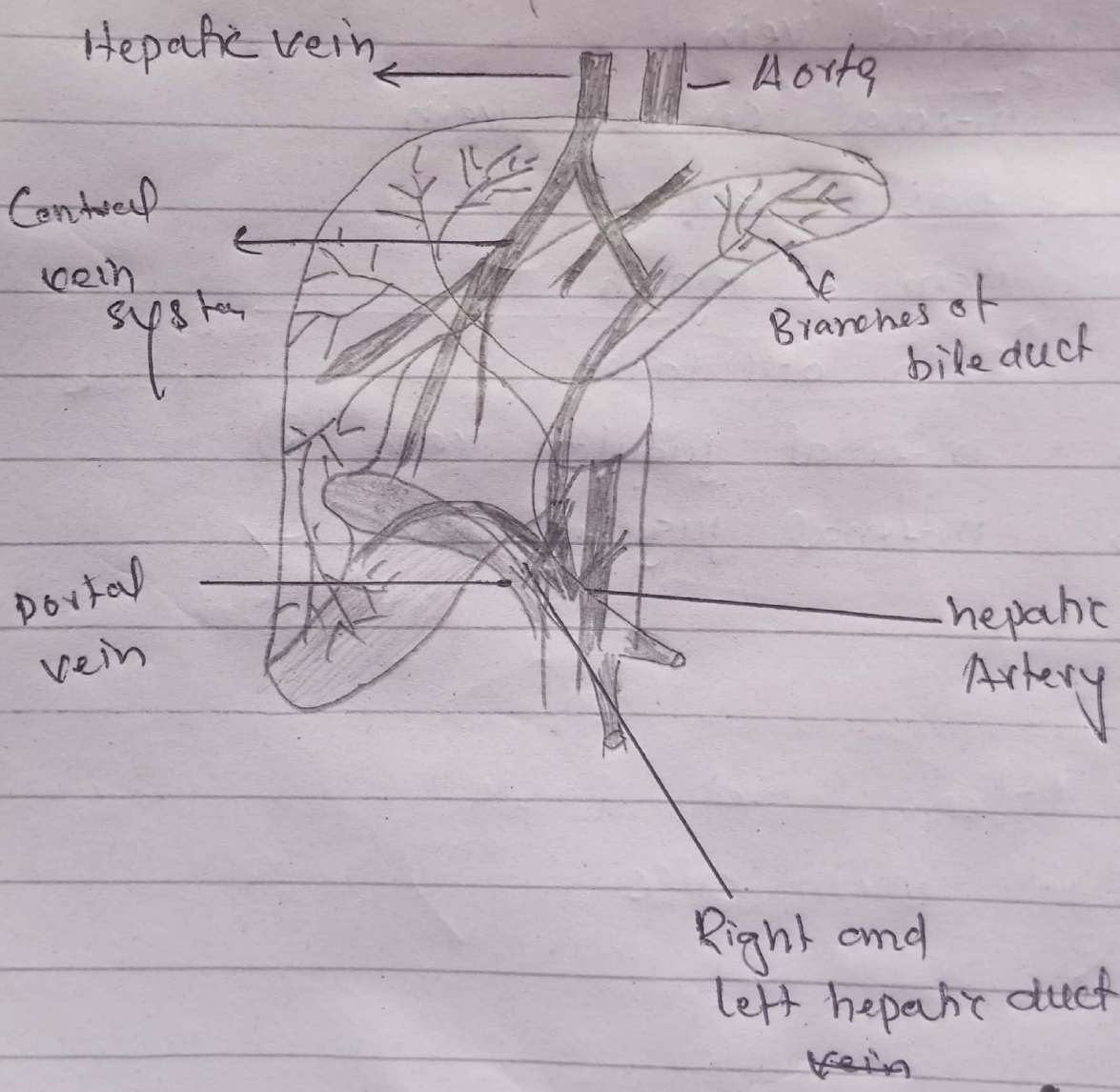
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## ⇒ Contraindications :-

- \* Any electrically, magnetically or mechanically activated implant (e.g. Cardiac Pacemaker, Insulin pump, biostimulator, neurostimulator, Cochlear implant, and hearing aids)
- \* Intracranial aneurysm clips (unless made of titanium)
- \* pregnancy (Risk vs benefit ratio to be assessed)
- \* Ferromagnetic surgical clips or staples
- \* Metallic foreign body in the eye
- \* Metal shrapnel or bullet
- \* Dialysis patient
- \* Bile leak/Biloma (do Eovist MRI instead)
- \* Hemangioma
- \* Cholangiocarcinoma
- \* Infiltrative HCC or vascularinvasive HCC
- \* Elevated Total Bilirubin  $> 3.5$
- \* Main indication is evaluation of arterial anatomy, vascular patency

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# Liver Anatomy

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Q 3:- How will you Explain MRI Spine (Explain Spine Sequence and nomenclature - - - Explain it:-

Ans:- Magnetic Resonance imaging (MRI) of the spine are is a safe and painless test that ~~used~~ used a magnetic field and radio waves to produce detailed picture of the spine (the bone disks and other structures in the back)

⇒ Indication:-

- ⇒ Congenital spinal cord malformation
- ⇒ Multiple Sclerosis
- ⇒ inflammatory disorder
- ⇒ Spinal infection
- ⇒ Trauma
- ⇒ Degenerative disease
- ⇒ Neoplastic abnormality
- ⇒ Spinal cord herniation
- ⇒ CSF leakage.

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The spine are divide into -

- ⇒ Cervical Spine
- ⇒ Thoracic Spine
- ⇒ Lumbar Spine

## Procedures:-

Cervical Spine:-

- First we should provide Cervical Spine coils to the patient,
- ⇒ The patient will positioned supine and head first
- ⇒ Sagittal images should be include from the skull base through at least C7 and T1 intervertebral disc - 1
- ⇒ The axial image should be contiguous slice from the skull base to C7 and T1.

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⇒ Thoracic Spine:-

⇒ Sagittal and Axial image should be included to the area of clinical interest

- if the entire spine is to be studied then the images should be included from C7 to L1 with Axial and Sagittal plane-

⇒ if there is a disc pathology, then the axial images should be approximately parallel to the disc-

Lumbar Spine:-

⇒ After positioning the patient the entire lumbar spine should be imaged in the sagittal sequence and include the entire neural foramina and also with paraspinous soft tissue-

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## Spinal Sequences:-

⇒ The choice of MRI pulse sequence is generally standardized for particular studies - but can be guided by the clinical history and physical examination.

- Commonly used sequence in MRI imaging of the spinal include -

⇒ T1, Intermediate TE

⇒ proton density or

⇒ FLAIR

⇒ T2 weighted imaging sequence

⇒ and also various fat suppression technique.

⇒ T2\* or gradient echo have also a good signal in the spinal imaging.

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⇒ disc slip:-

⇒ A slipped disc is also called "Herniated disc"

Your Spinal cord is made up of a series of bones. These bones are cushioned

by discs. The discs protect the bones by absorbing the shock from daily activities like walking.

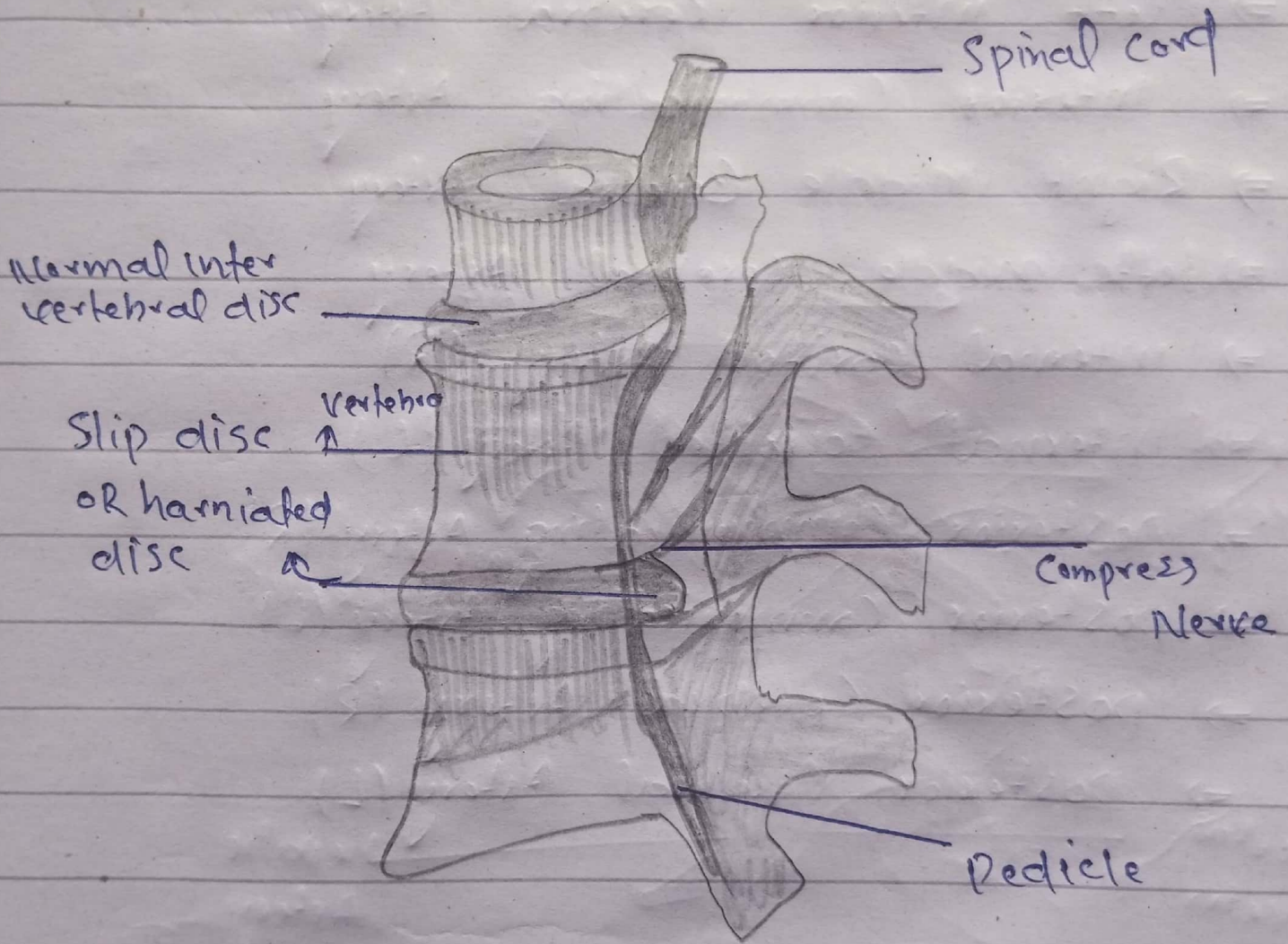
⇒ Each disc has two parts: a soft gelatinous inner portion and a tough outer ring.

→ Injury or weakness can cause the inner portion of the disc to protrude through the outer ring, known as a slipped disc or herniated disc.



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# Slipped disc:-



(Herniated Disc)  
slip disc

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Qy:- What is MRA and MRV?

Ans:- MRA Brain:-

⇒ MRA stand for magnetic resonance imaging Angiography (MRA) -

⇒ MRA is used to access into the arterial blood supply for various abnormalities in system of brain -

⇒ its a most common technique used to access into blood supply of the brain -

⇒ MRA brain is Easy to perform and does not required contrast administration

⇒ But some time a contrast is also used to see the abnormality,

- Contrast can cause an allergic reaction -

## Indication:-

- ⇒ Aneurysm
- ⇒ Stroke
- ⇒ vaso spasm
- ⇒ vasculitis
- ⇒ Stenosis of Arteries
- ⇒ Internal Carotid Artery occlusion
- ⇒ Arteriovenous malformation
- ⇒ Basilar Artery Stenosis/occlusion

## Contraindication:-

- ⇒ In case of cardiac pacemakers
- ⇒ bio stimulator
- ⇒ stent implant
- ⇒ pregnancy (risk)
- ⇒ Metallic foreign bodies
- ⇒ Metal shrapnel
- ⇒ bullet
- ⇒ Surgical clips.

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patient preparation:-

- written consent from patient
- ⇒ Ask the patient to remove all the metal object
- ⇒ instruct the patient to do not move

position for MRA Brain

- ⇒ Supine and head first.
- ⇒ positioned the head in coil
- ⇒ Centre the laser beam

protocols: <

- localiser
- ⇒ T<sub>2</sub> TSE Axial
- ⇒ 3D Time of Flight (TOF) -

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## MRA :- Flow chart:-

- ⇒ Right Internal Cerebral Artery
- ⇒ Left Internal Cerebral Artery
- ⇒ Internal Communicating Artery
- ⇒ Right Middle Cerebral Artery
- ⇒ Left Middle Cerebral Artery
- ⇒ Internal Carotid Artery (R)
- ⇒ Internal Carotid Artery (L)
- ⇒ Posterior Communicating Artery (R)
- ⇒ Posterior Communicating Artery (L)
- ⇒ Posterior Cerebral Artery (R)
- ⇒ Posterior Cerebral Artery (L)

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## ⇒ MRV Brain:-

⇒ MRV Stand for magnetic Resonance venography,

⇒ MRV is used to access into the venous system of brain for the abnormalities and another disease -

### Indication:-

⇒ Evaluation of thrombosis

⇒ Tumor of the cerebral venous sinus

⇒ Drowsiness and Confusion.

### Contraindication:-

⇒ Cardiac pacemakers

⇒ Metallic Foreign body

⇒ Surgical clips

⇒ Intra cranial aneurysm clips.

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Patient position:-

⇒ patient are supine  
and head first

⇒ positioned the head  
coil

⇒ Centre the laser beam  
localizer over the glabella

Sequences:-

⇒ Axial T<sub>1</sub>

⇒ Axial T<sub>2</sub>

= CoR MRV 2D TOF

⇒ Axial T<sub>2</sub> TSE -

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## MRV :- Flowchart:-

- ⇒ posterior frontal vein
- ⇒ Anterior frontal vein
- ⇒ Frontopolar
- ⇒ vein of Tolard
- ⇒ parital vein
- ⇒ internal cerebral vein
- ⇒ basal vein
- ⇒ vein of galen
- ⇒ vein of labbe
- ⇒ internal jugular vein (R)
- ⇒ internal jugular vein L,



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Q NO 5 :- How you will prepare  
The patient for MRI Knee  
and procedure \*?

Ans :- Introduction :-

- \* The Knee joint is one of  
The important weight-bearing joints  
of the human body
- \* Complex and extensive movements  
are performed, involving numerous  
active and passive mechanisms.
- \* Knee is more likely to be  
damaged than most other  
joints because it is Subject to  
tremendous forces during vigorous  
activity.
- \* Therefore not surprising that the  
Knee is frequently effected by  
traumatic and degenerative  
Condition.

⇒ Indication : 2

- \* Fractures.
- \* Acute trauma.
- \* Chondromalacia.
- \* Degenerative Chondrosis.
- \* Osteochondritis.
- \* Osteochondral fractures.
- \* Osteochondral and articular cartilage infractions.
- \* Ligament tears: Cruciate, Collateral, retinacular.
- \* Infection of bone, joint or Soft tissue
- \* Neoplasms of bone, joint or Soft tissue.
- \* Vascular Condition: entrapment aneurysm, Stenosis, Occlusion
- \* Mechanical Knee Symptoms: Catching, locking, Snapping, Crepitus,
- \* Marrow abnormalities: avascular necrosis, marrow edema syndromes, and stress fractures.

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## Contraindication :-

- \* Intra Cranial aneurysm Clips
- \* Pregnancy
- \* Ferromagnetic Surgical Clips
- \* Metallic foreign body
- \* Metal Shrapnel or bullet.

## ⇒ Patient Preparation :-

- 1) A Satisfactory written Consent form must be taken from the patient before entering the Scanner room.
- 2) Ask the patient to remove all metal objects including keys, coins, wallet, cards with magnetic strips, jewellery, hearing aid and hairpins.
- 3) If possible provide a Chaperone for claustrophobic patients (e.g. relative or staff)
- 4) Offer earplugs or headphones, possibly with music for extra comfort.

- 5) Explain the procedure to the patient.
- 6) Instruct the patient to keep still
- 7) Note the weight of the patient.

### ⇒ Patient Position :-

- 1) Feet first supine
- 2) Position the knee in the knee coil and immobilize with cushions
- 3) Give cushions under ankle for extra comfort
- 4) Center the laser beam localise over the lower border of patella.

### ⇒ Protocol :-

- 1) Field of view (FOV) -- Small 10 to 14 cm
- 2) A matrix of  $256 \times 256$  is usually standard.
- 3) Dedicated knee coil is mandatory as it improves the signal to noise ratio

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## ⇒ Sequences :-

- 1) A Three plane localiser.
- 2) Fast Spin echo PD and T<sub>2w</sub> in the sagittal plane.
- 3) STIR Sequence in the Coronal plane (marrow).
- 4) T<sub>1w</sub> Coronal images.
- 5) T<sub>2w</sub> axial images.

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23/06/2020