

M T W T F S

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Name:

Mehboob-Ur-Rshman

ID:

13817

Subject:

MRI Procedures.

Teacher's Name:

Mam- Atooba

Final exam Paper

Q 2

Ans

MRI Brain

Magnetic Resonance Imaging of the brain is one of the most commonly used tests in neurology and neurosurgery. MRI provides exquisite detail of brain, spinal cord and vascular anatomy and has the advantages of being able to visualize anatomy in all three planes: Axial, Sagittal, and Coronal.

Its Magnetic Resonance Imaging of the brain uses magnetic resonance imaging to produce high quality two dimensional images of the brain and brain stem without the use of ionizing radiation or radioactive tracers.

Important sequences

The most common An MRI sequence in magnetic resonance (MRI) is a T1-weighted spin echo sequence. A gradient echo sequence

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P-T-0

is the base of many important
desired sequences such as echo-Planar
Imaging and SSFP.

↳ Localize - 3 Plane
↳ T_2 - se - tra P. Diffusion
weight sequence

↳ T_2 - flair - tra

↳ T_2 - se - cor

↳ T_2 - se - sag

↳ DWI - epi trace - tra

↳ Contrast enhancement

↳ T_1 - se - Cor Post Gd

↳ T_1 - se - Tra Post Gd

- Axial sequences
- Sagittal sequence
- Coronal sequence

MRI Brain Procedure

Indication:

- ↳ Multiple sclerosis (MS)
- ↳ Primary Tumors Assessment and
/ or metastatic disease
- ↳ Intracranial (cerebral vasculature Accident (CVA))
- ↳ Transient ischaemic attack (TIA)
- ↳ Cerebrovascular attack (CVA)
- ↳ Hemorrhage
- ↳ Hearing Loss

↳ Visual Disturbances

↳ Infection trauma

↳ Unexplained neurological symptoms

or deficit.

↳ Mapping of brain function.

↳ Headaches.

↳ Trauma.

↳ Vascular Pathologies.

↳ Contraindication.

↳ Any electrically or magnetically or mechanically activated implant like Cardiac Pacemaker.

↳ IntraCranial aneurysm clips

↳ Pregnancy.

↳ Ferromagnetic surgical clips or staples.

↳ Metallic foreign body in the eye.

↳ Metallic sharpened or bullet.

Patient Preparation for MRI brain

↳ A satisfactory written consent form must be taken from the patient before entering the scanner room.

↳ Ensure the IV line prior to the precontrast acquisition preferably with 20 or 22 gauge IV cannula.

↳ Pts who present with claustrophobic features may require sedation with diazepam / alprazolam / midazolam.

↳ Offer earplugs or headphones & possibly with music for extra comfort.

↳ Explain the patient to keep still.

↳ Instruct the ~~patient~~ patient to keep still.

↳ Note the weight of the patient.

Positioning for MRI Brain

↳ Head first supine.

↳ Position the head in the head coil and immobilise with cushions.

P-T-0

↳ Give Cushion under the leg for extra comfort.

↳ Centre the laser beam localised over the glabella

↳ Indications for contrast enhancement

↳ Tumor, Metastasis, Cranial nerve lesion, indeterminate intracranial lesion, IAC mass.

↳ cavernous angioma, Amyloid, angioPathy, Neurocysticercosis

↳ meningitis, Encephalitis, Cerebellar spread

↳ Multiple sclerosis, HIV infection, abscess.

↳ Syringomyelia (Syrinx)

M → a → d → d

Q2

MRI Livers

Ans

Indication:

- ↳ Evaluation of diffuse liver disease such as haemochromatosis, haemosiderosis, fatty infiltration.
- ↳ Detection of focal hepatic lesions metastasis, focal nodular hyperplasia, hepatic adenoma.
- ↳ Lesion characterization. e.g. Cyst, focal tract haemangioma, hepatocellular carcinoma.
- ↳ Clarification of findings from other imaging studies or laboratory abnormalities.
- ↳ Evaluation of tumor response to treatment e.g. Post-chemotherapy or surgery.
- ↳ Evaluation of known or suspected congenital abnormalities.
- ↳ Evaluation of known or suspected metastasis.
- ↳ Liver iron content determination.
- ↳ Potential liver donor evaluation.
- ↳ Evaluation of ~~portal~~ vascular patency.
- ↳ Evaluation of cirrhotic livers.

P-T-0

↳ Contraindication

↳ Metal shrapnel

↳ Metallic foreign surgical clips

↳ Patients with Pacemakers, defibrillators, or other implantable electronic devices cannot be scanned using

Magnetic Resonance Imaging (MRI)

↳ Pregnancy and allergies to contrast

↳ Lesions of the liver, pancreas and bile ducts

↳ Claustrophobia

↳ Liver Anatomy

↳ The liver consists of two

main lobes. Both are made

up of eight segments. That

total consist of 1000 lobules (small lobes)

↳ The common hepatic duct transports

the bile made by the liver

cells to the "gallbladder" and "duodenum"

Via the Common bile duct.

↳ Reddish Colour.

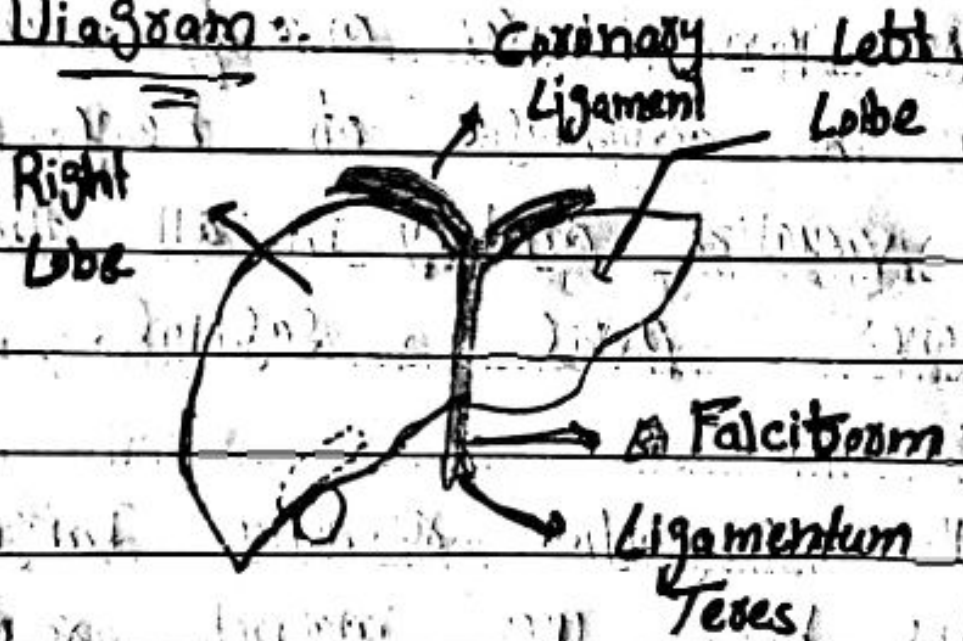
↳ Weight 250g approx.

↳ Largest internal ^{body} organ.

↳ Largest gland.

↳ Largest organ apart from skin.

Diagram



Liver

Q 3

Ans

MRI Spine :-

↳ MRI uses a magnetic field, radio waves and a computer to create images of soft tissue, bones, and internal body structures. MRI of the spine allows physicians to examine the spine anatomy to rule out any structural abnormalities.

↳ An MRI scan provides a different kind of image from other imaging test like x-ray, ultrasound, or CT scans. An MRI of the lumbar spine shows the bones, disks, spinal cord and the spaces between the vertebral bones where nerve pass through.

↳ The entire exam is usually completed within 30 to 60 minutes.

↳ If contrast material is used, more images will be taken after the injection.

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Standard Spine Sequence.

↳ T₂ - weight - Axial and Sagittal.

↳ T₂ - weight - Sagittal + 1-axial.

↳ ~~STIR~~ STIR or T₂W

Fat sat, Sagittal.

Additional Sequence.

↳ Axial Gradient Echo, Standard for Cervical Spine.

↳ Trauma

↳ Coronal STIR

↳ CSF Flow Imaging: Cervical Junction obstruction.

Disc Pathology Nomenclature.

↳ Standardization nomenclature approved in 2002.

(A) Protrusion.

(B) Extension.

(C) Extrusion.

Agreed upon definition of

Bulge ($> 180^\circ$)

Protrusion

Extrusion

Dis. Nomenclature Summary:

Bulge ($> 180^\circ$) of the

Circumference

Hexiation ($< 180^\circ$)

Broad b/w 90° and 180°

Focal ($< 90^\circ$)

of protrusion. Wide neck.

Extrusion: Narrow Neck

- Migration, remain in continuity.

- Sequestration, fragment no longer in continuity.

Explain disc slipcases.

is a medical condition affecting

the spine due to trauma, lifting

injuries, or idiopathic (unknown) causes

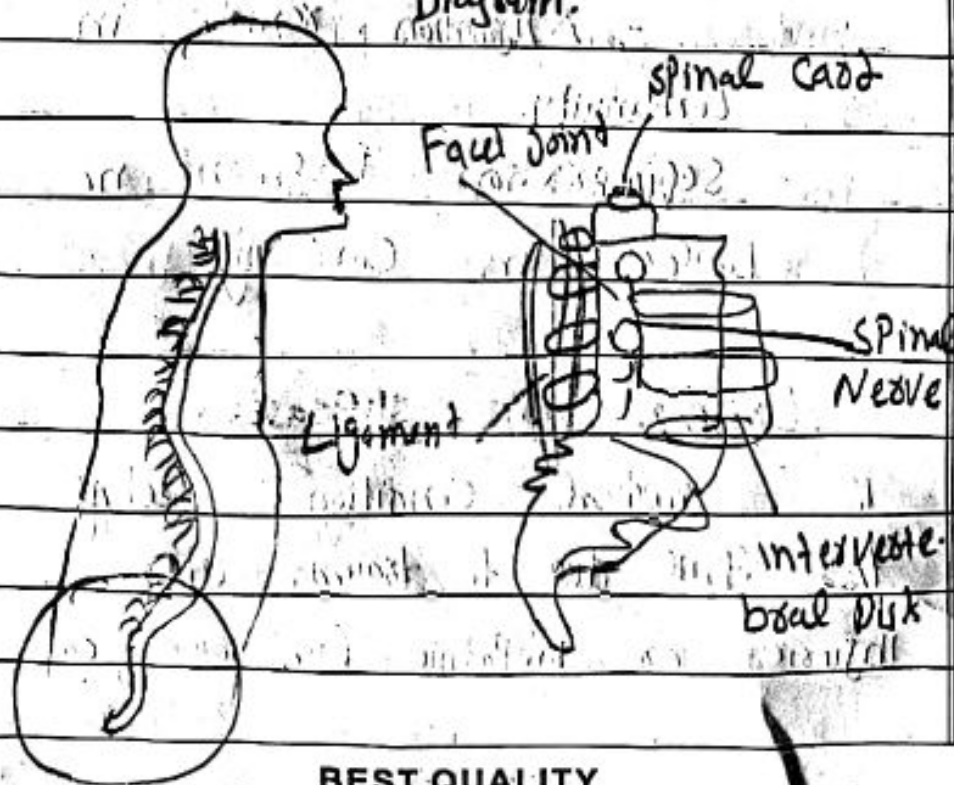
P-T-O

in which a tear in the outer fibrous ring (annulus fibrosus) of an intervertebral disc (discus intervertebralis) allows the soft central portion (nucleus pulposus) to bulge out beyond the damaged outer ring.

↳ Normal situation and spinal disc herniation in cervical vertebrae.

A slipped disc occurs when a soft cushion of tissue b/w the bones in your spine pushes out. This painful part it presses on nerves.

Diagram.



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Q4

Ans

Magnetic resonance angiography and venography are minimally invasive imaging techniques that use a scanner which projects magnetic field radio waves into tubes to create images of the arteries and veins. These images assist in diagnosing vascular abnormalities without the use of X-ray technology and radiation is reduced.

How to Prepare for an MRA / MRV Scan:

↳ If you have any allergies, are taking medication, blood thinners, have claustrophobia, or are pregnant please notify the staff.

↳ Remove Jewelry and other metals object.

→ In the scan require contrast dye you should not 4-6 hours before the procedure - The dye is injected through an IV.

→ Coils are placed around the area that needs imaging.

What is Expect:

↳ The bed rises and moves you through the tunnel shaped machine -

As image are taken.

→ you may be asked to hold your breath in order to remain still during the scan.

Flow Chart

MRV

Dynamic Images Series

Contrast Arrival Time
(CAT) map

Contrast enhancement
(CE) map

CAT Histogram for
Voxels Above CE

Maximum CE
Threshold

Threshold

Yes
only one peak
in CAT histogram

No

First Peak: arterial CAT
Second Peak: Venous CAT

Venogram and
Venous dynamics

Flow chart of MRA

Time resolved MRA of
vascular malformation

n = 89

Exclusion:

Time-resolved MRA
of vasculature

5 rejected examinations

1 examination with

malformation n=83

major artifacts

ARM

n=22

VM

n=61

Q5

Ans

Knee MRI Scan 2

Indications:

- ↳ Evaluation of Cystic Lesions.
- ↳ Evaluation of vascular Patency.
- ↳ Fractures.
- ↳ Acute trauma.
- ↳ Degeneration chondrosis.
- ↳ Neoplasms in bone.
- ↳ Vascular condition.
- ↳ Laboratory abnormalities.
- ↳ Evaluation of known.
- ↳ Suspected metal.
- ↳ Ligament tears, cruciate, collateral, retinaculum.
- ↳ Lesion characterization - eg Cyst, Focal Fat etc.
- ↳ Chondromalacia.
- ↳ Evaluation of ~~known~~ Cystic Lesions.

Contraindications:

- ↳ Mechanically activated Implant.
- ↳ eye Contact Pacemaker, hearing aids, Cochlear Implant etc.
- ↳ Dental Filling.
- ↳ Pregnancy.
- ↳ Staples.
- ↳ bullet.
- ↳ Ferromagnetic / Surgical clip.

Patient Preparation:

- ↳ Note the weight of the Patient.
- ↳ A satisfactory written consent form must be taken from the Patient before entering the scanner room.
- ↳ Instruct the Patient to keep still.
- ↳ Explain the procedure to the Patient.

P-T-0

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↳ Written consent form.

Positioning:

↳ Feet biast supine.

↳ Position the knee in the knee coil and immobilise with cushions.

↳ Supine position.

↳ Straps.

↳ Centre the lucases beam localizer over the lower border of Petale.

