Radiology Techniques Department

Special Radiological Procedures-1

(مسائي)

lecture 10

Magnetic resonance imaging (MRI) of the liver and biliary tree

By

MR.T Hussein Ayyed

MS.c Nariman Neamah

Magnetic Resonance Imaging of the Liver

MRI is the modality of choice for detection and characterization of the liver lesion and a **minimum field strength of 1.5 Tesla** and multichannel phased array coil.

- by differing sequences and after contrast agents used to differentiate characteristic appearances of liver lesion from normal liver tissue.

- the basis for liver lesion characterization based on **enhancement properties** (the timing, degree and nature of tumor vascularity)

Indications

1. detection of liver lesions.
2. characterization of liver lesions.

*Most metastases are hypo- to isointense on **T1** and iso- to hyperintense on **T2**-weighted images.

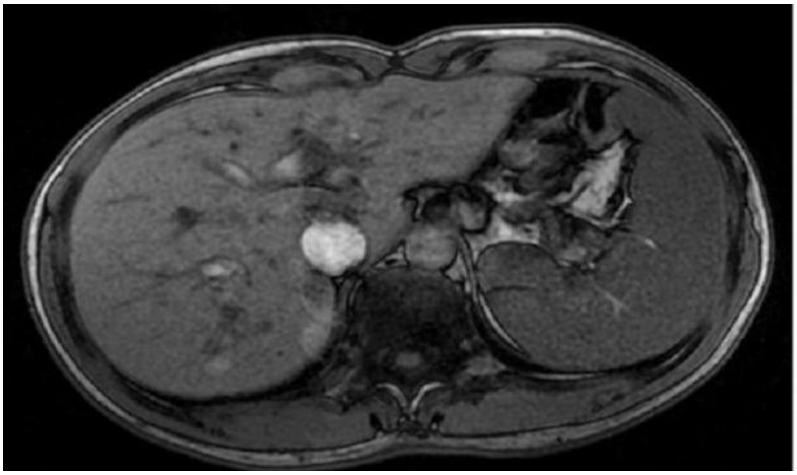
- hyperintense = brighter than the thing we are comparing it to.
- isointense = same brightness as the thing we are comparing it to.
- hypointense = darker than the thing we are comparing it to.

MRI pulse sequence

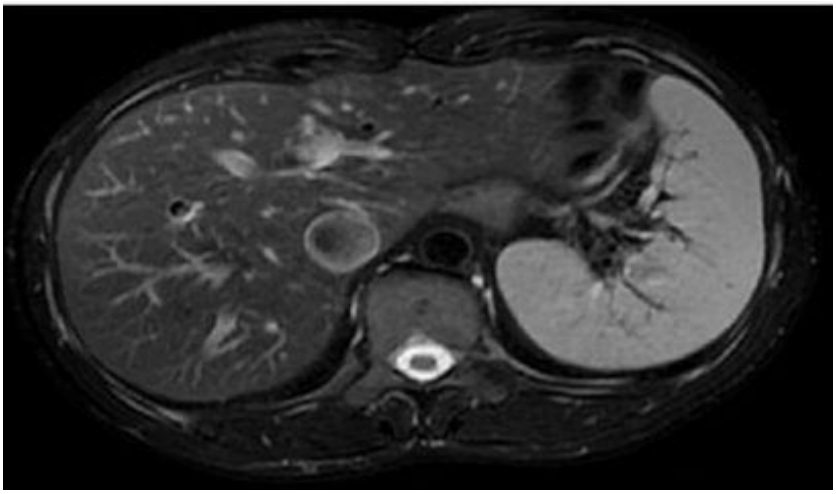
1. **The standard liver protocol consists of unenhanced T1w and T2w pulse sequence**

Compart between fluid and fat

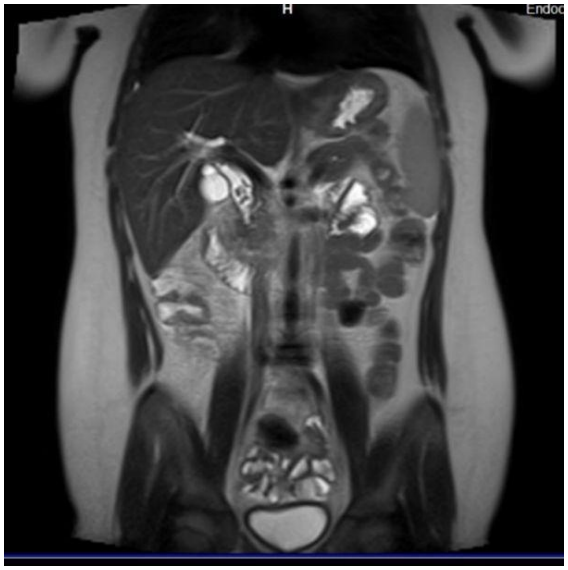
Fluid	Fat
T1 ⟶ dark	T1 ⟶ bright
T2 ⟶ bright	T2 ⟶ darker than fat signal on T1image



T1 Axial Image



T2 Axial Image



T2 coronal image of the abdomen

2. Fat suppression sequence

Fat suppression is commonly used in magnetic resonance (MR) imaging to **suppress** the signal from **fat tissue**. It can be applied to both T1 and T2 weighted sequences but Fat-Suppressed T1-Weighted sequence used most common.

fat	T1-Weighted sequence	Fat-Suppressed T1-Weighted sequence
Appearance	Bright	Dark (suppress)

Fat suppression play role in

1. Decreases the motion artifact from subcutaneous and intraabdominal fat
2. Improves signal-to-noise and contrast-to-noise ratios of focal liver lesions

T2 coronal image of the abdomen with fat suppression

3. Diffusion Weighted Imaging

This very rapidly acquired sequence forms an image based on the microscopic motion of water molecules (**restricted motion of water molecules**) and provides additional information regarding both lesion detection and characterization.

4. Contrast-Enhanced MR Liver Imaging

Gadolinium enhanced **T1** weighted MRI-it's possible to obtain images during **arterial phase** (ideal for metastatic disease and hepato-cellular carcinoma) **portal phase** (hypovascular malignancy) and **equilibrium phase** (cholangiocarcinoma, slow-flow haemangiomas and fibrosis).

* Gadolinium-based MRI contrast agent is administered intravenously in approximately (0.1_0.2 mL/kg)

Magnetic resonance cholangiopancreatography (MRCP)

MRCP is a **noninvasive** technique, which uses **heavily T2-weighted** images to demonstrate the intra- and extrahepatic biliary tree and pancreatic duct.

*Most commonly **used to** demonstrate the **presence** of **stones** and the **level** and **cause** of **obstruction**.

Advantages:

1. Non-invasive
2. No need for Contrast administration
3. Accurate evaluation of stricture, morphology, & length.

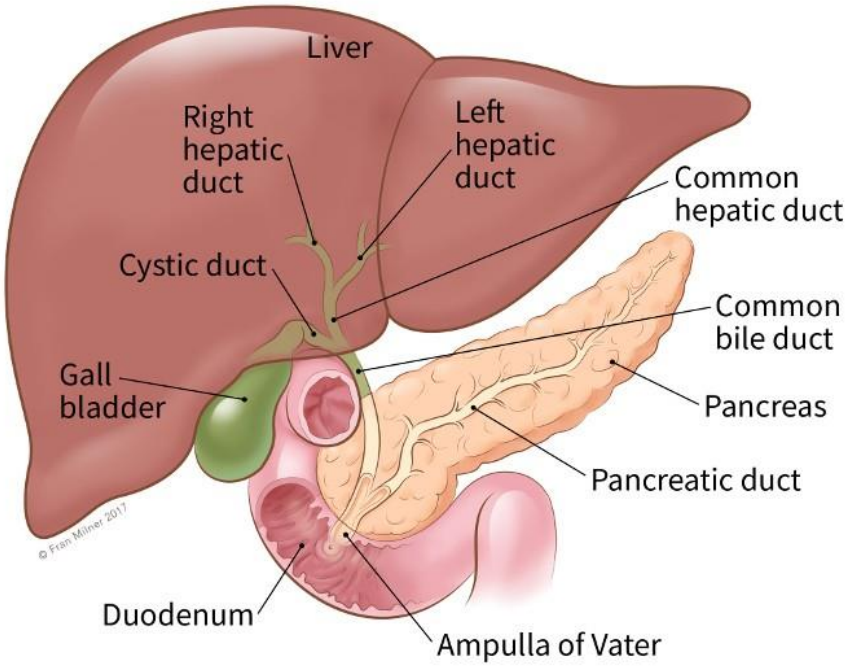
Indications:

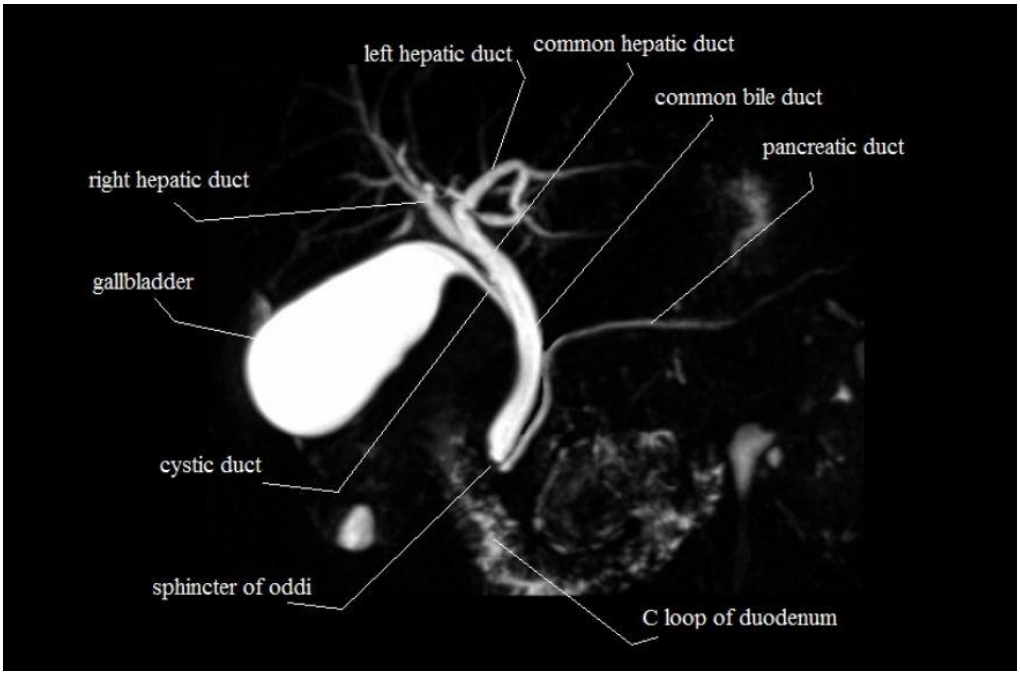
1. Investigation of obstructive jaundice

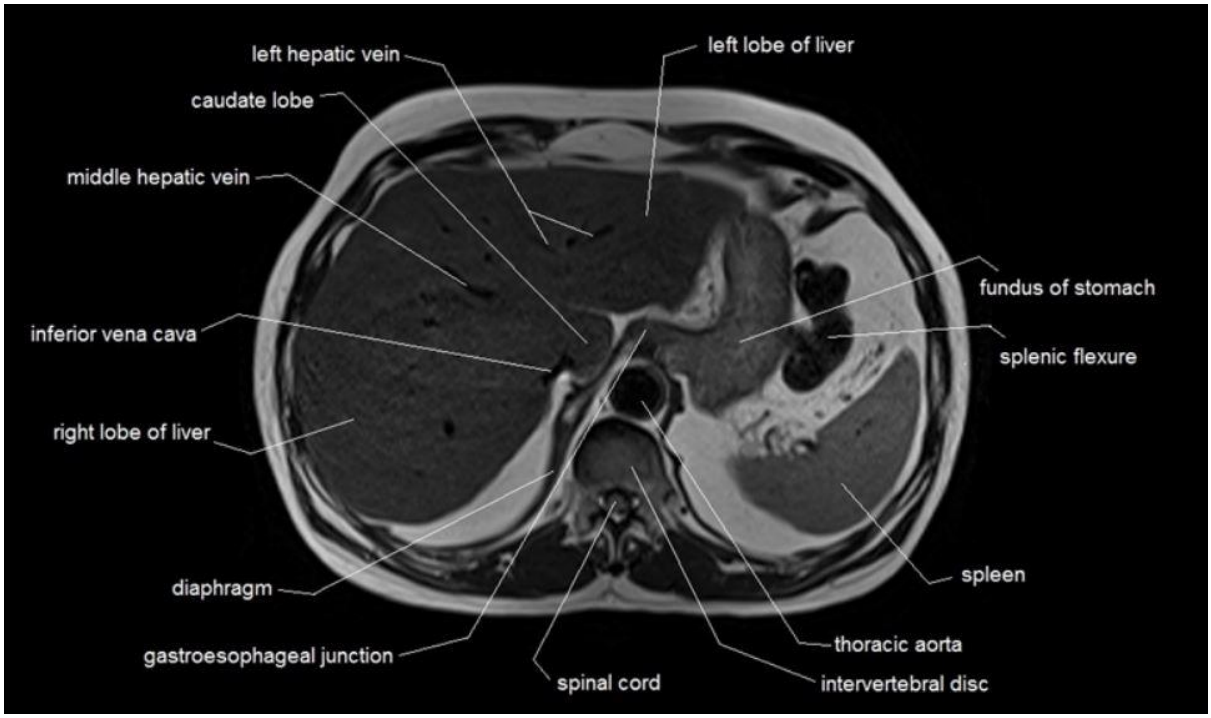
2. Suspected bile duct stones

3. Suspected chronic pancreatitis

4. Suspected sclerosing cholangitis (chronic inflamed and scarred of bile ducts)






left hepatic vein
left lobe of liver
caudate lobe
middle hepatic vein
fundus of stomach
inferior vena cava
splenic flexure
right lobe of liver
diaphragm
spleen
thoracic aorta
gastroesophageal junction
spinal cord
intervertebral disc


lungs
diaphragm
spleen
right lobe of liver
right kidney
intervertebral disc
minor calyx
vertebral body
psoas muscle