



Radiology Techniques Department
Special Radiological Procedures-1

lecture 10

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

By

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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.

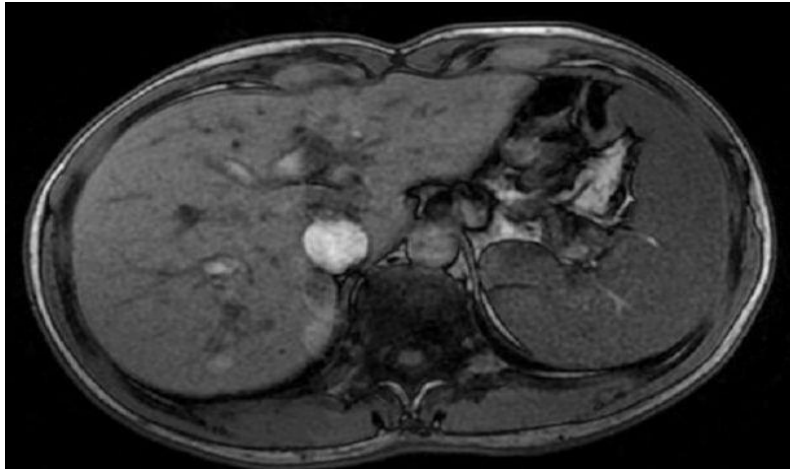
- hyperintense = **brighter** than the thing we are comparing it to.
- isointense = **same brightness** as the thing we are comparing it to.
- hypointense = **darker** than the thing we are comparing it to.

MRI pulse sequence

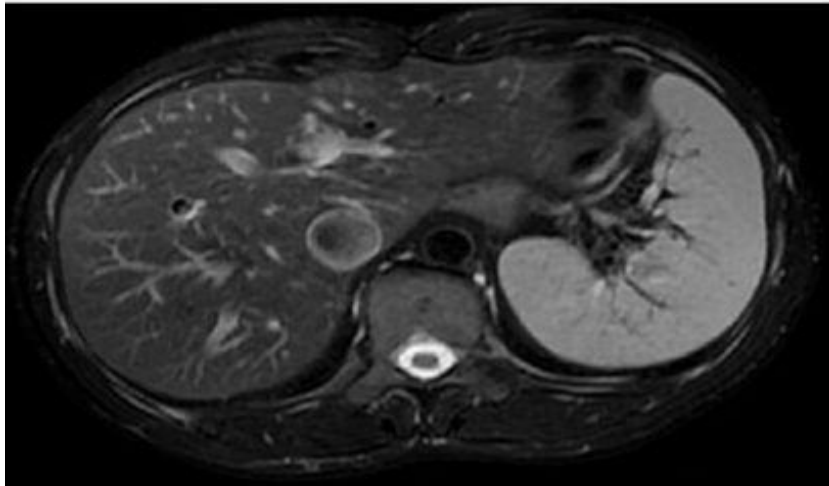
1. The standard liver protocol consists of unenhanced T1w and T2w pulse sequence

Compare between fluid and fat

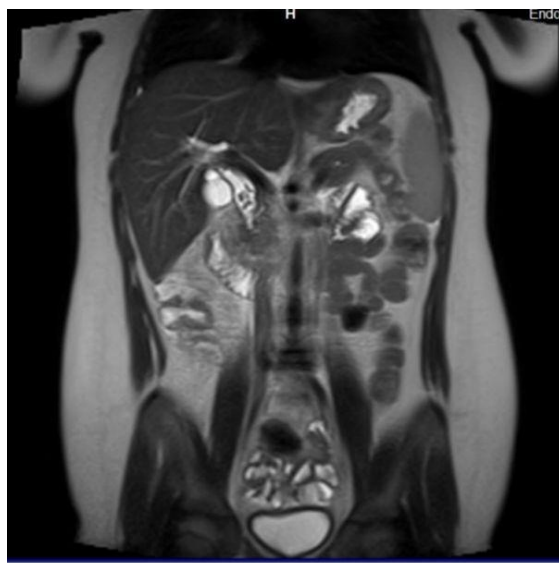
Fluid	Fat
T1 → dark	T1 → bright
T2 → bright	T2 → darker than fat signal on T1 image



T1 Axial Image



T2 Axial Image



T2 coronal image of the abdomen

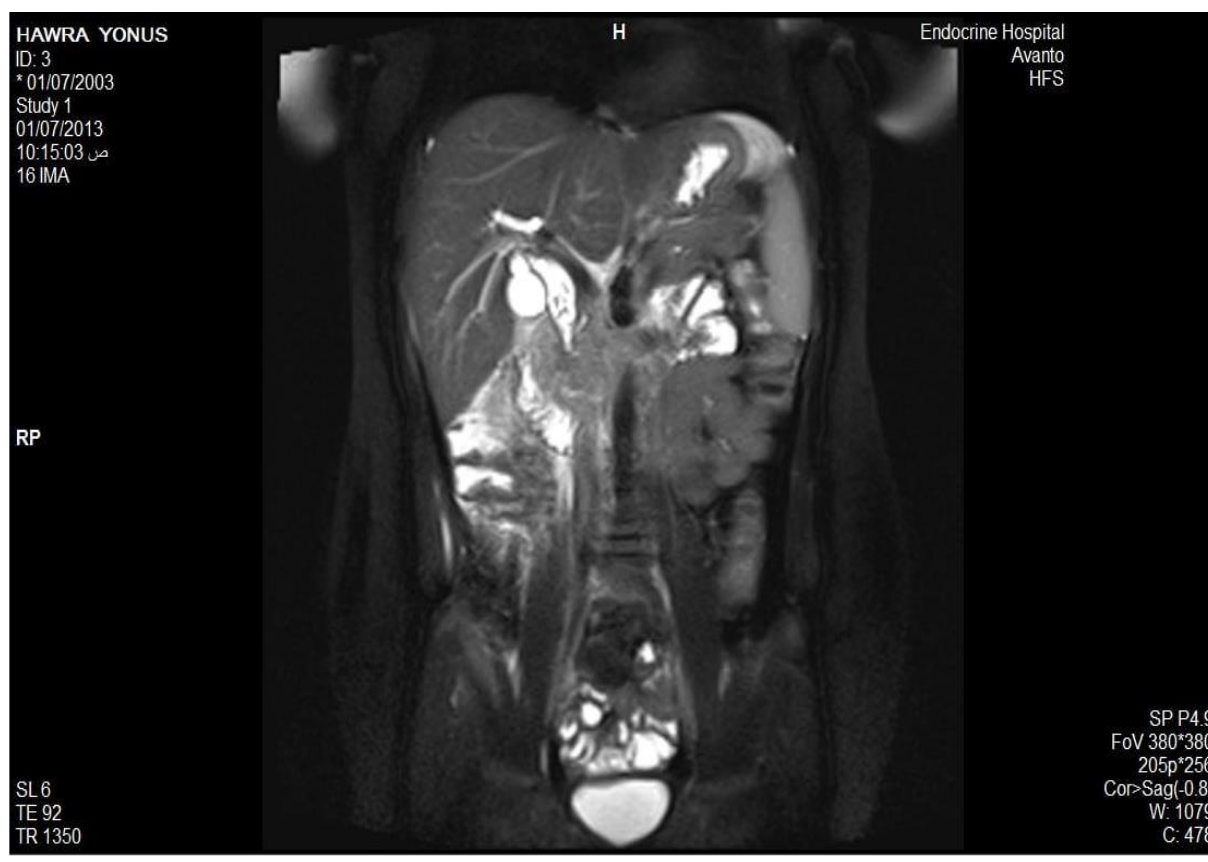
2. Fat suppression sequence

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

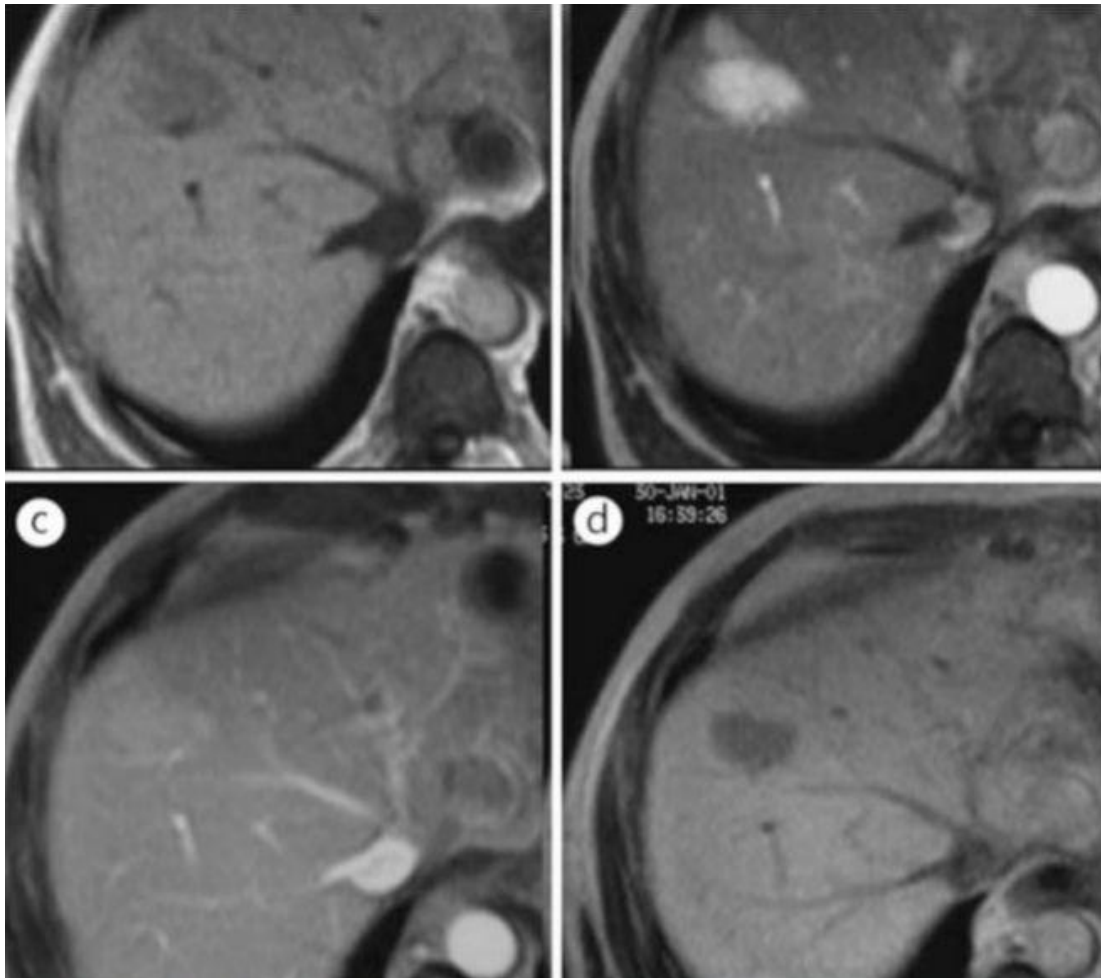
3. Diffusion Weighted Imaging

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.

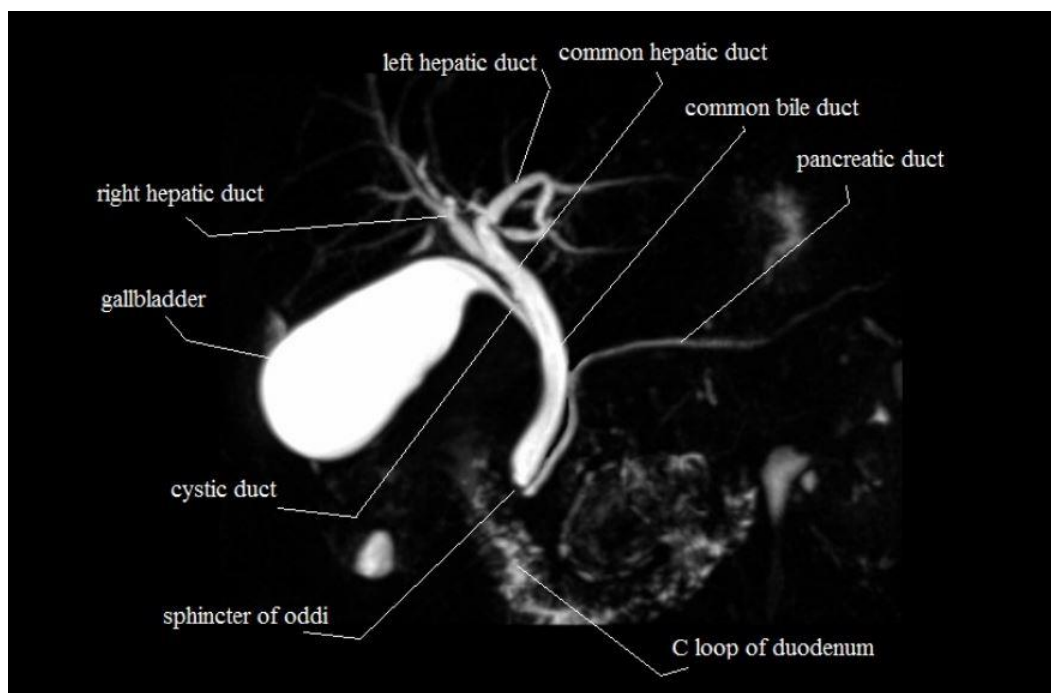
*Most commonly **used to demonstrate the presence of stones** and the **level and cause of obstruction**.

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**)



To summarize the liver examination methods, here are these abbreviations

1. Plain film

2. Ultrasound (US):

(a) Transabdominal

(b) Endoscopic

© Intraoperative.

3. Computed tomography (CT), including:

(a) Routine 'staging' (portal venous phase) CT

(b) Triple phase 'characterization' CT

© CT cholangiography

4. Magnetic resonance imaging (MRI)

5. Endoscopic retrograde cholangiopancreatography (ERCP)

6. Percutaneous transhepatic cholangiography (PTC).

7. Operative cholangiography.

8. Postoperative (T-tube) cholangiography.

9. Angiography-diagnostic and interventional.

I wish you success