

# MRI of Focal Liver Lesions: A Step-By-Step Approach

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## Overview

This is lecture 3 of 4. The first two lectures discussed protocol optimization and contrast agent selection. Accordingly this lecture focuses on image interpretation, emphasizing an algorithmic step-by-step approach, as outlined briefly below and discussed in greater detail in the lecture itself.

## Step 1: Review clinical background

Key questions:

- Age?
- Gender?
- History of liver disease?
- History of systemic disease with possible hepatic manifestations?
- Cirrhosis or other risk factors for HCC (e.g., long-standing HBV infection)?
- Other risk factors for specific lesions (e.g., use of OCP for hepatic adenoma, Budd-Chiari for hyperplastic nodules)?

## Step 2: Assess background liver

Key questions:

- Cirrhosis?
- Vascular abnormalities?
- Biliary abnormalities?
- Steatosis?
- Iron overload?
- Hepatocellular dysfunction (if hepatobiliary agent administered)?

## Step 3: Assess lesion's temporal and spatial contrast enhancement pattern (using information from dynamic images)

Key features:

- Arterial-phase enhancement:
  - hyper-, iso-, hypo-, or non-enhancement relative to liver
  - diffuse, heterogeneous, continuous peripheral, or discontinuous peripheral enhancement
- Portal or late venous phase enhancement

- hyper-, iso-, hypo-, or non-enhancement relative to liver
- peripheral (ring) enhancement, peripheral washout, central wash-in, coalescence
- rate of enhancement decline in venous phases relative to blood pool
- Hepatocellular phase enhancement (if hepatobiliary agent administered):
  - hyper-, iso-, hypo-, or non-enhancement relative to liver

#### **Step 4: Assess lesion structure (using information from all images)**

Key questions:

- Size?
- Mass-like or non-masslike?
- Shape: round/oval, lobulated, wedge-shaped, linear, or geographic?
- Surface: smooth or irregular?
- Margination: well-defined or ill-defined?
- Architecture: homogeneous, ring, target, or mosaic?
- Other features: capsule, internal fibrous elements (scar, septa)?

#### **Step 6: Assess lesion effect on other structures (using information from all images)**

- Capsule: bulge, retraction, or no effect
- Vessels and bile ducts: displacement, obstruction, invasion, or no effect

#### **Step 7: Assess ancillary features**

Key questions:

- Signal intensity relative to liver on different sequences
  - T1w
  - T2w
  - T2\*w
  - DWI
- Lesion contents
  - Fat content relative to liver and, if any, other lesions?
  - Iron content relative to liver and, if any, other lesions?
  - Hemorrhage?
  - Ischemia or necrosis?
- Other liver lesions: presence, number, and characteristics

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