

Focal Liver Lesions in the Non-Cirrhotic Liver

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1. Hepatic Cyst

Hepatic cysts are common benign lesions that occur in 2%-10% of the population. They may be solitary or multiple and range in size from a few millimeters to several centimeters. Hepatic cysts are usually discovered incidentally and have no malignant potential.

On MR imaging, they are well-defined, round or oval lesions with thin, almost imperceptible walls. Simple cysts are very hypointense on T1-weighted sequences and very hyperintense on T2-weighted sequences, corresponding to the signal characteristics of fluid.

Additionally, simple cysts demonstrate no internal architecture and no gadolinium contrast enhancement.

Biliary hamartoma may be indistinguishable from simple hepatic cysts but are also benign entities.

Indeterminate subcentimeter hypodensities seen on CT in patients with known primary carcinomas can usually be definitively diagnosed on MRI.

2. Cavernous Hemangioma

Cavernous hemangiomas are the most common benign hepatic neoplasm. They are often discovered incidentally with no clinical consequences.

On MRI, cavernous hemangiomas are well-defined, round or lobulated lesions. They are usually hypointense on T1-weighted sequences and very hyperintense on T2-weighted sequences, approaching the signal characteristics of fluid.

The contrast enhanced features of cavernous hemangiomas differentiate them from hypervascular or

cystic malignant neoplasms. Most commonly, cavernous hemangiomas demonstrate nodular enhancement where the nodules becomes more numerous and/or confluent over time. In larger cavernous hemangiomas, the central portion may not enhance owing to fibrosis, thrombosis or calcification.

With some cavernous hemangiomas smaller than 1.5 cm, immediate homogeneous enhancement may be observed (“flash filling”). In other small ones, a small enhancing component may remain the same size on all contrast-enhanced phases (“dot sign”) or grow (“growing dot sign”).

3. Focal Nodular Hyperplasia (FNH)

Focal nodular hyperplasia is the second most common benign hepatic neoplasm. It is believed to result from a hyperplastic response to a preexisting vascular malformation. FNHs contain disorganized nodules of hepatocytes and Kupffer cells which are separated by small bile ducts that lack communication with the normal biliary tree. FNH is usually solitary and less than 5 cm in diameter. They are mostly found in women.

MR imaging characteristics of FNH include isointensity or slight hypointensity compared with normal hepatic parenchyma on the T1-weighted sequences and slight hyperintensity or isointensity on the T2-weighted sequences. FNH is usually homogeneous in signal intensity with the exception of the central scar. The central scar is hypointense to the lesion and surrounding liver on the T1-weighted sequences and hyperintense on the T2-weighted sequences.

Following gadolinium-chelate administration, the lesion demonstrates marked homogeneous intense enhancement in the arterial phase, homogeneous wash-out in the portal venous phase, and isointensity or mild hyperintensity in the

portal venous phase The central scar demonstrates delayed enhancement. Only approximately 40% of FNH's exhibit all of these MRI characteristics.

FNH may retain contrast and be hyperintense compared with surrounding liver on delayed phase imaging (20 minutes or later depending on the agent) with hepatobiliary gadolinium-based agents. This may also occasionally be seen with hepatocellular adenomas.

4. Hepatocellular adenoma (HCA)

Hepatocellular adenoma is a benign hepatic neoplasm composed of hepatocytes with an absence of normal portal structures. This uncommon neoplasm is seen in association with oral contraceptive use, anabolic-androgenic steroid use, hepatic steatosis, glycogen storage disease types I and III, and other clinical conditions. Complications include acute hemorrhage and rare malignant transformation.

HCAs are classified into four subgroups according to phenotype, genotype, and clinical features; hepatocyte nuclear factor 1 α -inactivated (*HNF1 α*), inflammatory, β -catenin mutated, and unclassified

On MRI, about 85% of HCAs are iso- to slightly hyperintense on T1WIs, and about 80% are hyperintense on T2WIs. On T1-weighted images, foci of hyperintensity may be present from prior hemorrhage. Foci of hypointensity may represent necrosis or calcification. HCAs commonly contain lipid, and 20% have a central scar. The "atoll" sign on T2WIs, a hyperintense rimlike band in the periphery of the lesion that is isointense to the surrounding liver in the center of the lesion, when seen may be specific for inflammatory HCA in the appropriate clinical setting

With dynamic gadolinium-enhanced imaging, heterogeneous arterial phase enhancement is often seen, usually less intense than FNH. Some diffusely fatty LCAs do

not enhance on arterial phase images.

HCA usually do not retain contrast compared with surrounding liver on delayed phase imaging (20 minutes or later depending on the agent) with hepatobiliary gadolinium-based agents. This feature may sometimes be useful in distinguishing between FNH and HCA.

5. Focal Steatosis (Fatty Infiltration)

Fatty infiltration, or hepatic steatosis, is a common condition characterized by accumulation of lipid within hepatocytes. The most common causes include alcohol, obesity, diabetes mellitus, and malnutrition. cirrhosis. Consequently, MR imaging may play a role in Focal forms of fatty infiltration, which can simulate a tumor on CT or ultrasound, can be readily distinguished from a mass lesion on MRI by the absence of associated mass effect and the demonstration of lipid using chemical shift techniques (i.e. the loss of signal on opposed phase images compared to that on in-phase ones.

6. Hepatic Abscess

Hepatic abscesses may result from bacterial, fungal or parasitic infection. In the United States and Europe, bacterial abscesses are most common. Worldwide, however, parasitic abscesses are most common.

On MRI, hepatic abscesses have nonspecific imaging characteristics. In the appropriate clinical setting, multiple lesions demonstrating hyperintensity on T2-weighted images with perilesional edema and rim enhancement are suggestive of abscesses.

7. Metastasis

On MRI, hepatic metastases often demonstrate hypointensity on T1-weighted images and hyperintensity on T2-weighted images. Occasionally they are difficult to detect on non-contrast-enhanced images without DWI

Hypervascular metastases may be identified only on arterial phase images. On the portal venous phase, metastases may demonstrate inhomogeneous or ring enhancement with early peripheral washout .

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