Focal nodular hyperplasia of the liver with atypical CT and MR imaging features: diagnosis by contrast-enhanced harmonic power Doppler ultrasound

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Section: Abdominal imaging
Imaging Technique: CT
Imaging Technique: MR
Imaging Technique: Ultrasound-Colour Doppler
Case Type: Clinical Cases
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Patient: 38 years, female

Clinical History:

Incidental US discovery of a 2.5-cm hypoechoic nodular lesion of the liver in a 38 years old female with history of oral contraceptives assumption. Normal laboratory findings

Imaging Findings:

The patient underwent abdominal ultrasound (US) for left renal colic at another institution. US revealed a 2.5-cm hypoechoic nodular lesion of the II hepatic segment. The patient was therefore referred to our institution for further liver imaging evaluation. She had normal laboratory tests and no history of malignancy. The patient had been taking oral contraceptives for six years before the incidental discovery of the lesion. Contrast- enhanced spiral CT, dynamic contrast-enhanced MR imaging and contrast-enhanced harmonic power Doppler US were performed. The Doppler study included morphologic assessment of tumor vascularity and time-intensity analysis of lesion enhancement curve. Final diagnosis was established by tissue-core percutaneous biopsy.

Discussion:

Focal nodular hyperplasia (FNH) of the liver is a regenerative lesion composed of benign-appearing hepatocytes and Kupffer cells occurring in a liver that is otherwise histologically normal. The lesion is supplied by large arteries accompanied by fibrous stroma containing ductules. The stroma is usually prominent, forming a central stellate scar. Current theory is that FNH is either a congenital or a acquired anomaly of the arterial supply leading to focal hyperfusion of the liver parenchyma. The lesion is usually asymptomatic and has a marked female preponderance. Complications such as hemorrhage, rupture, or malignant transformation are uncommon in this lesion. Surgery, therefore, is not recommended for asymptomatic patients with FNH. The diagnosis of FNH is usually made by contrast-enhanced spiral CT or MR imaging. On CT images, the lesion is usually isodense to the liver in the precontrast scan, in which a central hypoattenuating area can be seen. It shows a clear-cut enhancement in the arterial phase (usually sparing the central scar), with rapid wash-out in the portal venous phase and with enhancement of the central stellate scar. At MR imaging, FNH generally appears isointense to liver parenchyma both on T1-weighted and T2-weighted images. The central scar and the radiating fibrous stroma, however, appear hypointense on T1-weighted images and hyperintense on T2-weighted images. After administration of gadolinium chelates, the features resemble those seen on spiral CT. In our case, the lesion did not show these typical features
on spiral CT and MR images (Figs 1, 2). Color and power Doppler US may show suggestive features for FNH, when intratumoral vessels with an arterial Doppler spectrum, radiating from the center to the periphery of the lesion are seen. In our case, however, power Doppler US study showed no intratumoral blood flow signals (Fig 3 a). Contrast-enhanced harmonic power Doppler US was therefore performed, along with a time-intensity analysis of contrast enhancement. Contrast enhanced harmonic power Doppler US enabled a precise delineation of the vascular architecture of the lesion, allowing the detection of small-sized arteries which originated from a central large vessel, and radiated to the periphery of the lesion (Fig 3 b, c). Time-intensity analysis of lesion enhancement curve demonstrated a rapid peak of contrast enhancement followed by a rapid decrease, confirming the hypervascular nature of the lesion (Fig 3 d). These features, in view of the clinical context of the patient, suggested the diagnosis of FNH, which was confirmed by histologic biopsy.

Differential Diagnosis List: Focal nodular hyperplasia of the liver.

Final Diagnosis: Focal nodular hyperplasia of the liver.

References:


Differentiation of hepatocellular adenoma and focal nodular hyperplasia of the liver: comparison of power Doppler imaging and conventional color Doppler sonography.

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Fagniez PL, Zafrani ES, Mathieu D, Dhumeaux


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proved cases. AJR 156: 317-320. (PMID: 1898806)
Mahfouz AE, Hamm B, Taupitz M, Wolf KJ

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differentiation of focal nodular hyperplasia

from malignant tumors with dynamic

Gadolinium-enhanced MR imaging.

Radiology 186: 133-138. (PMID: 8416554)
**Description:** The lesion is located in the II hepatic segment and is isoattenuating to normal liver parenchyma (ie, not detected) in the unenhanced spiral CT image.

**Origin:**
Description: In the arterial phase, the lesion is hardly recognizable because it is slightly hyperattenuating. Origin:
Description: In the portal venous phase, the lesion is isoattenuating Origin:
Description: In the delayed phase, the lesion is slightly hypoattenuating Origin:
Figure 2

Description: In the SE T1-weighted image, the lesion is slightly hypointense Origin:
Description: In the FSE T2-weighted image, the lesion is isointense Origin:
Description: Dynamic GRE contrast-enhanced MR imaging study: the lesion is isointense throughout the study.

Origin:
Description: In the delayed SE T1-weighted image, the lesion is isointense.
Description: No intranodular blood flow signals are detected within the lesion at conventional power Doppler US

Origin:
Intratumoral vessels with a stellate aspect, radiating from the center to the periphery of the lesion, are detected at harmonic power Doppler after intravenous administration of an US contrast agent.

Intratumoral vessels show pulsatile arterial flow at Doppler spectral analysis.
Description: Time-intensity wash in-wash out curve: time-intensity analysis of the lesion enhancement curve shows a rapid peak of enhancement in the arterial phase, followed by rapid decrease in the venous phase.

Origin: