Benign liver lesions. Radiological characteristics and uptake patterns. Importance of diagnostic imaging with contrast ultrasound, CT and MRI

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Purpose

To describe the radiographic features and the different behavior with different means of contrasts of benign liver lesions with the combined use of imaging techniques to arrive at a reliable diagnosis.
Methods and Materials

Benign liver tumors are a heterogeneous group of lesions without clinical features of malignancy, which in most cases are an incidental finding. The main problem is to ensure the benign nature of these lesions.

We have the combined use of techniques such as ultrasound contrast, MDCT and MRI with different contrasts that allow dynamic studies in different vascular phases.

We describe the radiological features and enhancement patterns that allow obviate the percutaneous biopsy in many cases and the risks and complications involved.

We show examples of simple cysts, hydatid cysts, biliary hamartomas, hemangiomas, abscesses, cystadenomas, fat lesions, FNH, adenoma and regenerative nodules in cirrhotic liver.
Results

Hepatic cysts. Fig 1

True hepatic cysts arise from abnormal development of the bile duct precursors (Meyenburg's complexes) and are lined by cuboidal epithelium. On US, hepatic cysts appear as spherical homogeneous structures with an imperceptible wall, lack of internal echoes, absence of internal flow on Doppler and posterior acoustic enhancement. On CT, they are homogeneous, with attenuation of 0-10 Hounsfield Units (HU). On MRI the fluid content of a cyst results in low signal on T1w imaging and very high signal on T2w imaging. They present lack any enhancement (internally or in the wall) with IV contrast medium.

Hydatid cysts. Fig 2

They have variable appearances features: daughter cysts, membrane separation, and wall calcification. The lesions may be multiple and vary widely in size.

US and CT demonstrates clearly not only the simple cyst form but also the more complex cyst features, such as the dependent debris, daughter cysts (cyst within a cyst appearance), membrane separation and wall calcification. MRI will define the cystic structure and internal anatomy but is insensitive to the calcification.

Hydatid cysts may be complicated by rupture that can be contained (hydatid material output between the pseudocapsule and liver), interconnecting (open to the biliary or vascular system) and direct (the contents out into the abdominal cavity or pleura).

Haemangiomas. Fig 3

Haemangiomas are the commonest benign hepatic tumors. They are well defined, lobular and homogeneous lesion. On US, Typical hemangiomas are hyperechoic while atypical hemangiomas can be hypo /isoechoic with hyperechoic ring. CT examination demonstrates a lesion with low attenuation (similar to that of blood).On MRI, T2 sequences demonstrates homogeneously high signal lesion, in excess of the spleen and approaching that of fluid.

After IV enhancement typical haemangiomas have rapidly enhancing vessels at their periphery visible in the arterial phase images. Over a period of minutes the lesion will 'fill in' centripetally to become iso or slightly hyper with the adjacent parenchyma. The less than 2 cm hemangiomas usually present a homogeneous enhancement in arterial and late phase. Thrombosed and large hemangiomas (> 5 cm) may show delayed contrast
enhancement with progressive accumulation of contrast and present hypodense central areas.

**Hepatic abscess Fig 4**

Bacterial abscesses are lesions characterized by irregular margins, thick walls, peripheral edema and multiple areas of necrosis with a tendency to confluence.

Following IV contrast medium they may demonstrate enhancement predominantly around the edge of the lesion, reflecting the increase in capillary permeability in the adjacent liver parenchyma (double target sign). Exceptionally, they can contain gas and it is diagnostic of the presence of gas-producing germs (if there was no manipulation or opening to hollow viscera).

**Focal nodular hyperplasia Fig 5**

They are vascular lesions composed of normal liver elements including hepatocytes, bile ducts, Kupffer cells and intervening fibrous septa. The lesions lack a true capsule and the presence of normal liver elements can make histological diagnosis difficult.

Its appearance is homogeneous and similar to liver in all imaging techniques. After the IV contrast administration, during the arterial phase the lesions usually enhance markedly and uniformly with the exception of the central scar, and large feeding vessels may be visible at the periphery. In the portal phase the attenuation of FNH lesions becomes equal to that of the adjacent liver parenchyma, the attenuation of the scar remaining low. On delayed imaging at several minutes the scar itself may show enhancement, although the rest of the lesion remains difficult to distinguish from the surrounding liver. On MRI the lesions are subtle being either iso-intense or of minimally reduced signal on T1w and increased signal on T2w images. They accumulate specific liver contrast.

**Hepatic adenoma Fig 6**

Adenomas are rare benign tumours composed primarily of hepatocytes, with no portal tracts or bile ducts. Kupffer cells are usually absent but some Kupffer cell activity is seen in up to 20 per cent of cases. Adenomas may have a fibrous pseudocapsule and a central scar, which can make differentiation from FNH difficult. They have a tendency to outgrow their blood supply resulting in haemorrhage, thrombosis and necrosis.

Uncomplicated lesions are usually homogeneous with a well-defined margin, when haemorrhage or necrosis is present the appearances are more heterogeneous.

On CT adenomas may be either of equal attenuation with adjacent liver, or of lower attenuation if they contain substantial amounts of fat. Calcification may be seen in areas of old haemorrhage. On MRI examination the lesions are well-defined isointense or slightly
hyperintense lesions on T2w and T1w images. On US the lesions may merge with the adjacent parenchyma but if they contain substantial amounts of fat they are well-defined echogenic lesions that mimic haemangiomas. On contrast US an CT they enhance markedly and uniformly during the arterial phase but rapidly merge with surrounding liver during the portal phase. On MRI hepatocellular adenomas enhance after administration of hepato-specific contrast as Mn-DPDP and Gd-EOB-DTPA but not after Gd-BOPTA.
Images for this section:

Fig. 1

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Conclusion

- The liver study with imaging techniques has significantly changed the approach of focal liver lesions by radiologists and clinicians.

- Current imaging techniques allow us to make a safe and reliable diagnosis of benign liver lesions, increasing patient comfort.


