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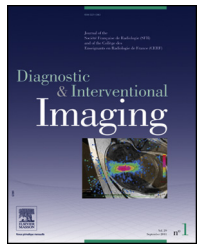

ICONOGRAPHIC REVIEW / *Gastrointestinal imaging*

Hepatic haemangioma: Common and uncommon imaging features

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Abstract The haemangioma, the most common non-cystic hepatic lesion, most often discovered by chance, may in certain situations raise diagnostic problems in imaging. In this article, the authors first demonstrate that the radiological appearance of the hepatic haemangioma, in its typical form, is closely related to three known histological sub-types. They then show that certain atypical features should be known in order to establish a diagnosis. They also observe the potential interactions between the haemangioma, an active vascular lesion, and the adjacent hepatic parenchyma. Finally, they discuss the specific paediatric features of hepatic haemangiomas and illustrate the case of a hepatic angiosarcoma.

Detected by chance in most cases, the hepatic haemangioma is the most common non-cystic hepatic lesion. The incidence may reach 20% according to several autopsy series [1].

In its typical form, the haemangioma is well known and does not raise diagnostic problems in imaging. However, certain ''variants'' and ''atypias'' may complicate the diagnosis.

The hepatic haemangioma is a benign vascular lesion. In the vast majority of cases, it is non-evolving and does not require treatment or monitoring.

Histologically, it is a mesenchymal lesion consisting of blood-filled vascular cavities of different size, surrounded by a simple layer of flat endothelial cells, supported by a fibrous connective tissue [2].

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The purpose of this iconographic review is to call to mind the classic radiological aspects of the hepatic haemangioma and the different atypical forms that this lesion may have. The potential interactions between the haemangioma and the adjacent hepatic parenchyma are also discussed. Finally, the specific paediatric features of hepatic haemangiomas are presented, illustrated by the case of a hepatic angiosarcoma.

Typical aspects

In its typical form, three histological sub-types have been described: the capillary haemangioma, the cavernous haemangioma and the sclerosing haemangioma, united by a common lesional continuum.

Cavernous haemangioma

The cavernous haemangioma is the most common histological sub-type and corresponds to the classic semiological description of the haemangioma in imaging.

This is a lesion consisting of large vascular spaces with a central cavernous zone, all the larger with a voluminous haemangioma, and not very extensive connective tissue [3].

In general, this typical appearance is observed in lesions less than 3 cm in diameter [4]. The outlines are sharp, well defined.

In the sonograph, it is a hyperechogenic, homogenous lesion presenting a posterior acoustic enhancement. According to Yu et al., there is a correlation between the echogenicity of the lesion, its internal architecture and its haemodynamic behaviour [5]. Therefore, the hyperechogenicity of cavernous haemangiomas seem to be related to the great many interfaces between the vascular spaces and the fibrous stoma as well as to the slower blood flow in the large vascular spaces [5].

In unenhanced CT, the density of the lesion is the same as that of the vessels.

In MRI, the lesion presents an homogenous and high intensity signal on T2-weighted images (similar to that of the cerebrospinal fluid), a low intensity signal on T1-weighted images and the absence of restriction of the apparent diffusion coefficient (ADC), with mean values much higher than that of the hepatic parenchyma and ranging from $1.69 \times 10^{-3}\,mm^2/s$ ($\pm 0.34 \times 10^{-3}\,mm^2/s$) [6] to $2.36 \times 10^{-3}\,mm^2/s$ ($\pm 0.48 \times 10^{-3}\,mm^2/s$) [7] according to the gradient values (b) used (Fig. 1a).

The enhancement kinetics is slow. Classically, a nodular peripheral enhancement is observed, as well as late, progressive, centripetal, full and persistent filling [3]. This enhancement kinetics is also observed by contrast sonography and is reproducible and specific (Fig. 1b) [8]. At the arterial time, ''bridged'' contrast enhancement crossing the lesion may be associated with early peripheral contrast enhancement (Fig. 1c) [8].

According to Yamashita et al. [9], the haemodynamic behaviour of haemangiomas depends on their inner structure and, in particular, on the size of the vascular spaces. Therefore, in cavernous haemangiomas, the diameters of the vascular spaces are significantly smaller in the early peripheral zones of enhancement in clusters compared with the central zone of progressive centripetal filling [9].

Capillary haemangioma

Also known as fast-flow haemangioma, the capillary haemangioma presents small vascular spaces and extensive connective tissue [3]. This form accounts for 16% of all haemangiomas [4]. It often consists of small lesions. According to Hanafusa et al. [10], 42% of these haemangioma are under 1 cm in diameter.

In sonography, these haemangioma are most often hypoechogenic and homogenous. This hypoechogenicity seems to be related to a predominant fibrous stroma as well as to a fast blood flow within the reduced vascular spaces, leading to less reverberation of the echoes [5]. In the color doppler, it is possible to observe an intra-lesional flow [4].

In CT, these small haemangiomas appear to be slightly hypodense without injection. The density is similar to that of the aorta but they may also be isodense and therefore sometimes not detectable [11].

The enhancement kinetics is rapid. An early, intense, homogeneous contrast is observed ''by flash'', similar to the aortic enhancement in the arterial phase [1]. Late, this enhancement follows that of the aorta, without washing [1], in particular distinguishing the haemangioma from hepatocellular carcinoma and certain hypervascular metastases. According to Yamashita et al., this enhancement dynamics is related to the presence of small vascular spaces, the size of which is similar to that of the peripheral zones of cluster enhancement [9].

In MRI, these small lesions also present an homogenous and high intensity signal on T2-weighted images as well as a contrast kinetics similar to that seen in X-ray computed tomography with a uniform and rapid enhancement [12].

The association with an arterioportal shunt is common. In this case, there is a transient perilesional enhancement (Fig. 2) [13].

Sclerosed haemangioma

Certain haemangioma may degenerate with an extensive fibrosis beginning at the centre of the lesion at the origin of the obliteration of the vascular spaces. This is also called a thrombosed or hyalinised haemangioma [14].

The criteria indicating the diagnosis of sclerosed haemangioma are the geography map appearance associated with a reduction in the volume of the hepatic parenchyma with capsular retraction. Lesional heterogeneity may also exist with the presence of cystic, haemorrhagic or fibrous patches [14].

In sonography, it consists of a globally heterogeneous lesion with hypoechogenic zones that may correspond to sclerotic zones in histology [14].

In CT, focal nodular focal patches are observed that are more spontaneously hypodense than the rest of the lesion, also corresponding to sclerotic zones [15].

In MRI, on T2-weighted images, signal is heterogeneous, the zones of central sclerosis appear in hypointense.

The enhancement kinetics is slow with a peripheral nodular enhancement, similar to the cavernous haemangioma, but with full and very late progressive filling. In fact, the