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CLASSICS IN ABDOMINAL RADIOLOGY

The "spoke wheel" sign in hepatic focal nodular hyperplasia

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The "spoke wheel" sign is a characteristic radiological finding of hepatic focal nodular hyperplasia (FNH). It refers to the internal vascular architecture seen in FNH, with central centrifugal arterial vessels radiating from a central artery toward the periphery of the lesion, resembling a ''spoke wheel'' (Fig. 1) [1].

FNH is the second-most common benign liver tumor after hemangioma, accounting for approximately 8% of all primary hepatic neoplasms. It occurs more commonly in women using oral contraceptive in third-fourth decades of life. FNH is a highly hypervascular tumor, which usually remains asymptomatic. For this reason, its diagnosis is incidental on abdominal imaging performed for other indications [2]. Differential diagnosis of FNH from other focal liver lesions is of clinical relevance, since surgical resection should be performed only in doubtful cases or in symptomatic patients [3].

Although the spoke wheel description was classically applied to the color/power Doppler sonographic appearance of large lesions [3], this finding is highly specific for FNH on contrast-enhanced ultrasonography (CEUS) (Fig. 2). Moreover, CEUS, being a real-time imaging modality, is more sensitive than Doppler US, dynamic CT, and MRI in the detection of the spoke wheel sign typically

Fig. 1 A wood spoke wheel. Public domain image (https://pixabay.com/it/ruota-legno-ruota-del-carro-isolato-2960045/). Accessed 29/09/2018

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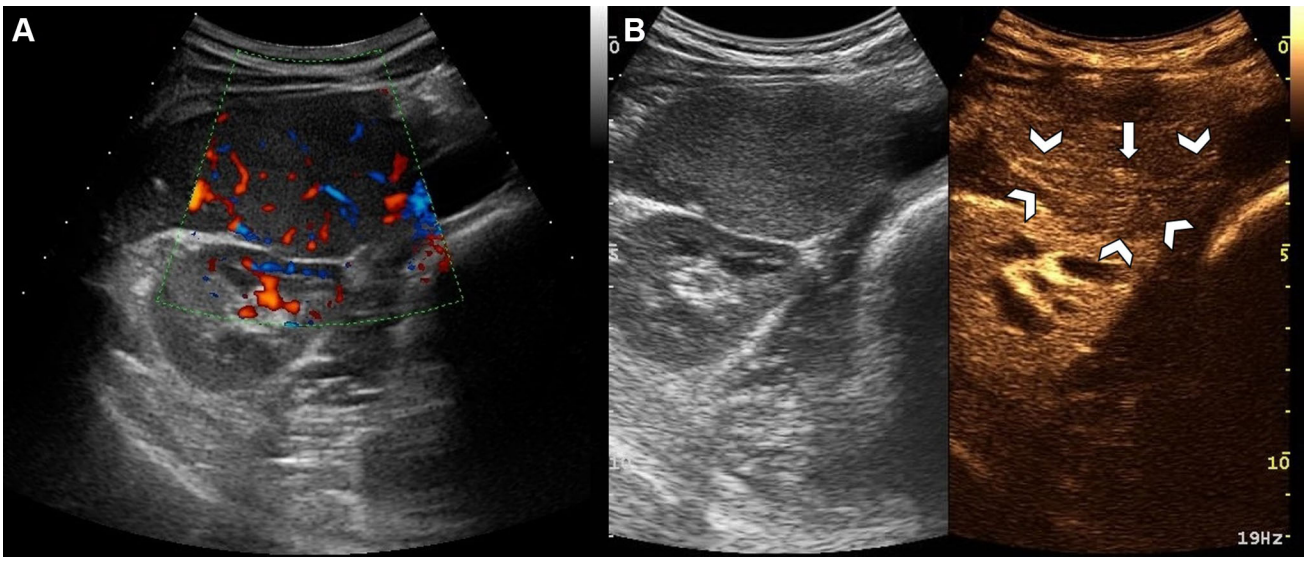

Fig. 2 Focal nodular hyperplasia in a 29-year-old woman. **a** Baseline US scan shows a round, sharply circumscribed, mildly hyperechoic lesion of size 5.8 cm in the VI hepatic segment. Color-Doppler demonstrates centrifugal arterial vascularity branching from the center toward the periphery of the mass. **b** Digital cineloops were registered during postcontrast US scanning with a double-/split-screen mode, allowing evaluation of both B-mode image (to the left) and contrast-enhanced image (to the right). The conventional grayscale image, displayed simultaneously, allows the operator to keep the lesion in the imaging plane and to facilitate enhancement characterization. The CEUS image obtained in the early arterial phase (i.e., 15 s from beginning of contrast agent bolus injection) depicts a central starlike fill-in corresponding to radiated arteries (arrowheads), resembling the "spoke wheel" pattern. An arterial feeding vessel is appreciable (arrow)

during the early arterial phase [4]. Histologically, this appearance may be related to the presence of a central stellate scar with radiating fibrous septa containing one or more large arteries, which can be seen more frequently in lesions larger than 3 cm in diameter [3, 5].

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

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Research involving human participants and/or animals This article does not contain any studies with human participants or animals performed by any of the authors.

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