

Morphological features of FNH in gadoxetic acid-enhanced liver MRI: Results of a multicenter trial

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Abstract

Rationale and Objectives: First reports indicate that with the new hepatocellular-specific contrast agent gadoxetic acid (Primovist®, Schering AG, Germany) the detection and characterization of focal liver lesions is possible with high confidence [1]. The aim of this evaluation was to assess the diagnostic performance with regard to lesion characterization and describe morphological features and enhancement pattern of focal nodular hyperplasia (FNH) in MR imaging of the liver with Primovist®.

Methods: In 182 patients, which were investigated in a phase III multicenter trial, 59 FNH were present (13=histopathology; 46=imaging follow-up). MR examination consisted of pre-contrast T1- and T2w sequences, of T1w dynamic sequences (arterial, portovenous, equilibrium) after bolus injection of 0.025 mmol gadoxetic acid (Primovist®, Schering AG) / kg bodyweight and of T1w sequences with fat-saturation in the hepatocyte-phase after 10 and 20 minutes. Morphological appearance and enhancement pattern of FNH were evaluated in an on-site evaluation. Contrast-to-Noise ratio (CNR) of FNH to normal liver parenchyma was calculated based on signal intensity measurements. The number of correctly characterized FNH according to the final diagnosis was assessed and compared to biphasic-enhanced spiral CT in an onsite evaluation and in an off-site evaluation with 3 blinded readers.

Results: FNHs were described as homogenous, round and well-circumscribed lesions in pre-and post-contrast MRI. A central scar was identified pre-contrast in 45% of lesions in T1w and in 52% in T2w, in the hepatocyte-phase after 10 and 20 min in 64%, respectively 60%. Signal intensity in T1w fs 20 min post was described as hyperintense in 38%, isointense in 32%, hypointense in 2% and as mixed in 28%. Complete or partial enhancement of the lesions in the arterial and portovenous dynamic phase was present in 94%, respectively 85% (Figure 1). Enhancement in the hepatocyte-phase after 10 and 20 min was seen in 88%, respectively 90%. Median CNR was -5.9 in T1w pre-contrast, 14.0 in the arterial, 2.4 the in portovenous, 2.9 in the equilibrium and 0.7 in the hepatocyte-phase after 10 min. Characterization of lesions was superior for combined pre- and post MRI (88.1%) in comparison to biphasic-enhanced spiral CT (84.7%, not significant) and pre-contrast MRI (67.8%, p<0.05) in the onsite evaluation; in the blinded reading two of the three readers achieved the significant highest proportion of correctly characterized FNHs in the combined pre- and post-contrast MRI (for exact results see Table 1).

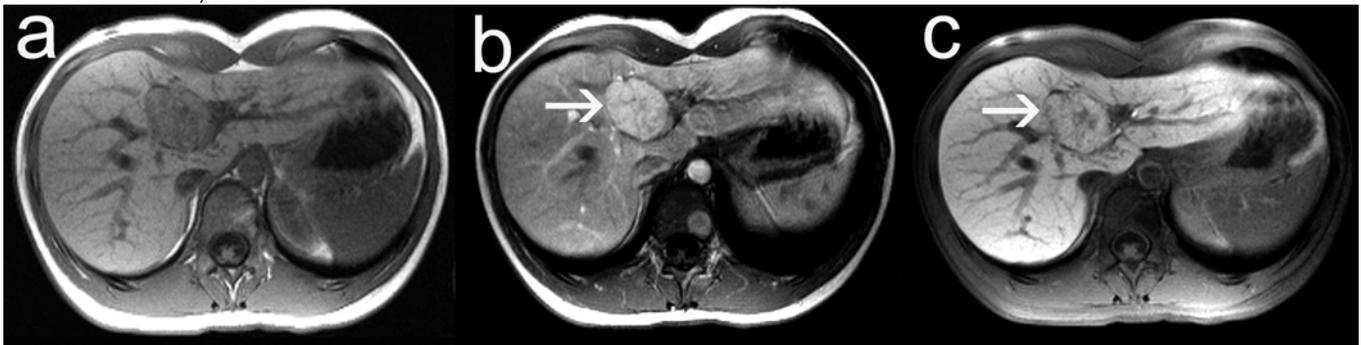


Figure 1: T1-w GRE sequence pre-contrast (a), in the arterial phase (b) and 20 minutes post injection of Primovist®. In the pre-contrast examination the lesion appears hypointens. Typical strong enhancement in the arterial phase allows good delineation of the FNH in segment 4 (large arrow). In the hepatocyte phase 20 minutes after injection liver-specific enhancement can be delineated in the lesion, which presents isointens to the surrounding liver parenchyma, confirming the benign hepatocellular nature of the lesion.

Conclusion: Gadoxetic acid-enhanced MRI provides a better characterization of FNH in comparison to pre-contrast MRI alone and spiral CT. In the dynamic examination enhancement characteristics well known from other extracellular agents can be seen, in the hepatocyte-phase a liver-specific enhancement is visible.

Table 1: Number (%) of correctly characterized FNH (n=59) at pre-contrast MRI, combined pre/ post-contrast MRI, and spiral CT – on-site evaluation and blinded reading

	Pre-contrast MRI n (%)	Combined MRI ^a n (%)	Correctly Characterized Lesions	
			Spiral CT ^b n (%)	Difference between Combined MRI ^a and: Pre-contrast MRI Spiral CT ^b
On-site	40 (67.8)	52 (88.1)	50 (84.7)	20.3 % (p<0.005) 3.4 % (p=0.69)
Reader 1	11 (18.6)	44 (74.6)	29 (49.2)	56.0 % (p<0.005) 25.4 % (p<0.005)
Reader 2	35 (59.3)	56 (94.9)	43 (72.9)	35.6 % (p<0.005) 22.0 % (p<0.005)
Reader 3	24 (40.7)	30 (50.8)	33 (55.9)	10.1 % (p=0.15) -5.1 % (p=0.65)

^a Combined pre-contrast, dynamic, and 20-minutes post-contrast MRI.

^b Biphasic enhanced spiral CT.

Literature:

[1] Huppertz A, Haraida S, Kraus A, Zech CJ, et al. Enhancement of Focal Liver Lesions at Gadoxetic Acid-enhanced MR Imaging: Correlation with Histopathologic Findings and Spiral CT--Initial Observations. *Radiology* 2005;234:468-478.