

Differentiation of Malignant from Benign Focal Splenic Lesions: Added Value of Diffusion-Weighted MR Imaging

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Target audience: Gastrointestinal radiologists who had difficulties in differential diagnosis between malignant and benign focal splenic lesions.

Purpose: To evaluate the added value of diffusion-weighted (DW) MR imaging for differentiating between malignant and benign focal splenic lesions.

Methods: The institutional review board approved this retrospective study and waived the requirement for informed consent. This study included 53 patients (mean age, 48.6 years; range, 21–75 years) with 11 malignant and 42 benign splenic lesions and who underwent gadoxetic acid-enhanced and DW MR imaging. All MR imaging examinations were acquired using a 3.0-T whole-body MR system and a 16-channel phased-array coil as the receiver coil. DW imaging was acquired simultaneously before the administration of gadoxetic acid using respiratory-triggered single-shot echo-planar imaging with b-values of 0, 100, and 800 sec/mm². The ADC was generated using a monoexponential function with b-values of 0 and 800 sec/mm².

Qualitative and quantitative analyses were conducted for splenic lesions by two independent observers at the two image sets, ie, conventional MR images vs. and combined conventional and DW MR imaging. For qualitative analyses, margin, signal intensity, and enhancement patterns of focal splenic lesions compared with that of adjacent normal splenic parenchyma was assessed on conventional MR and DW images. For quantitative analyses, the size of the lesions, ADC values, and the lesion to parenchyma ratios of ADC values were measured. Fisher's exact test, Mann-Whitney U test, and diagnostic performance (receiver operating characteristic curve analysis) were evaluated.

Results: All malignant lesions showed a hypovascular progressive enhancement pattern, while hypervascular enhancement patterns were only demonstrated in benign lesions (20, 47.6%) ($P < 0.05$). The mean ADC of malignant lesions (0.73×10^{-3} mm²/sec) was significantly lower than that of benign lesions (1.21×10^{-3} mm²/sec) ($P < .001$). The addition of DW images to conventional MR images showed a significant improvement for predicting malignant splenic lesions (area under ROC curve [A_z], from 0.774 to 0.983 for observer 1 and from 0.742 to 0.986 for observer 2) ($P < 0.001$). In addition, diagnostic accuracy, sensitivity, specificity, PPV, and NPV of combined conventional and DW MR images were higher than those of conventional MR images alone.

Discussion: Noninvasive differentiation of focal splenic lesions has been usually based on enhancement patterns seen after the injection of a contrast agent on CT and MR imaging. However, accurate differentiation of malignant from benign focal splenic diseases may not be possible solely on the basis of conventional morphologic imaging findings. Thus, we hypothesized that diffusion weighted (DW) imaging could be used to differentiate malignant from benign focal splenic lesions, and our results showed that the diagnostic accuracy of malignant splenic lesions increased significantly for both observers when DW imaging was added to conventional MR imaging.

Conclusion: The addition of DW imaging to conventional MR imaging may help to predict malignant splenic focal lesions compared to conventional MR imaging alone.

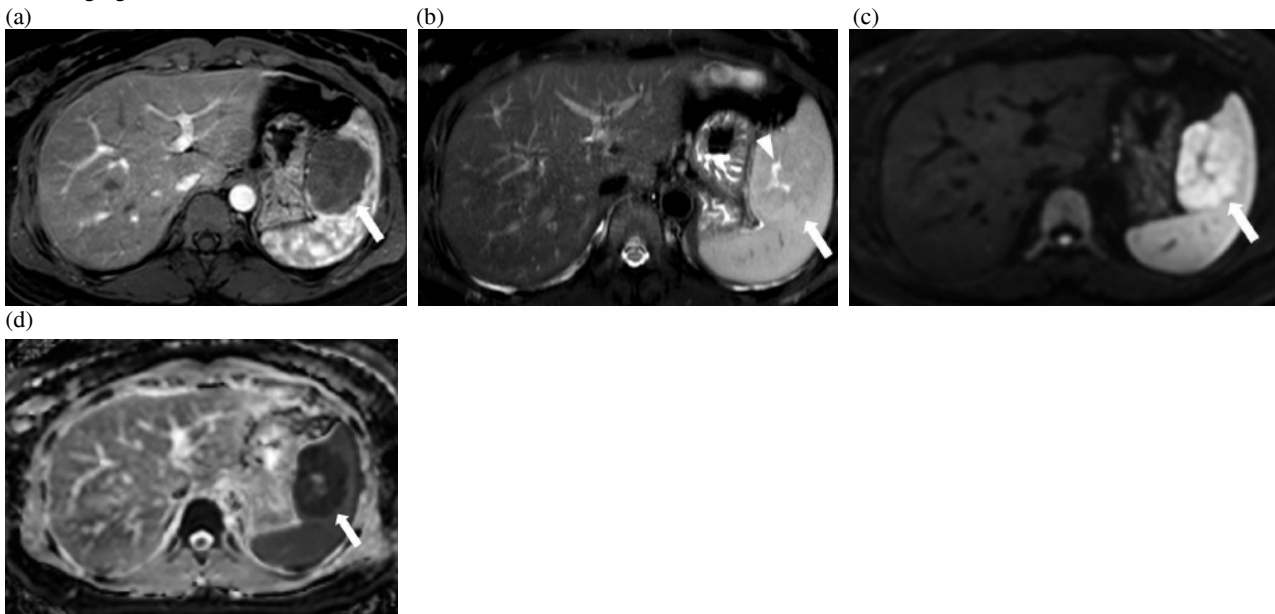


Figure. 42-year-old woman with diffuse large B-cell lymphoma in the spleen. Compared with the splenic parenchyma, the tumor (arrow) has hypovascular enhancement on (a) the transverse gadoxetic acid-enhanced arterial phase image and appears as an isointense lesion containing central necrosis (arrowhead) on (b) the transverse fat-saturated T2-weighted image, hyperintense lesion on (c) the DW image with b values of 800 sec/mm², and hypointense lesion on (d) the ADC map. The ADC value and tumor to splenic parenchyma ADC ratio are 0.55×10^{-3} mm²/sec and 0.58, respectively. The lesion was considered as an indeterminate splenic lesion on conventional MR images but was diagnosed correctly as a malignant splenic lesion after additional review of diffusion-weighted images by both observers.