

Diagnosis of liver metastatic lesions: performance of diffusion-weighted imaging compared to contrast-enhanced T1-weighted imaging.

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Introduction:

Gadolinium-enhanced T1-weighted imaging is highly accurate for the detection and characterization of focal liver lesions (1). However, with the recently identified risks of nephrogenic systemic fibrosis related to Gd exposure in patients with poor renal function (2), the optimization of non-contrast sequences is essential. Diffusion weighted imaging (DWI) can characterize liver lesions by means of ADC calculation (3,4). We also have evidence that DWI has a higher detection rate of liver lesions compared to conventional FSE T2 (5). There is limited data on the value of liver DWI in oncologic patients compared to Gd-enhanced sequences (6). The objective of our study is to assess the performance of DWI compared to Gd-enhanced sequences for detection of liver metastases in patients with primary cancer.

Methods:

In this HIPAA compliant study, 25 patients with primary cancer evaluated for liver metastases were retrospectively reviewed. Patients with cirrhosis or chronic hepatitis were excluded. MRI included axial breath-hold DWI (using tridirectional fat suppressed SSEPI, b=0, 50 and 500 sec/mm², TR/TE 1300-1400/67-82, matrix 144x192, slice thickness 7 mm, interslice gap 1.4 mm, FOV 300-400 mm) and fat suppressed 3D GRE Gd-enhanced T1 (TR/TE 3.3-4.5/1.4-1.9, flip angle 12°, 1 average, matrix 128-192 interpolated to 256 x 256, FOV 300-400 mm, interpolated slice thickness 2-3 mm) performed before and after dynamic injection of 20 mL of Gd-DTPA using at least 3 time points. An independent assessment of DWI vs. Gd-enhanced images was performed to detect liver metastases. The results were assessed against a reference standard represented by clinical and histopathologic results as well as prior or subsequent imaging studies.

Results:

On the reference standard, 16/25 (64%) patients had at least one liver metastasis. 4 patients had multiple confluent metastases interpreted as too numerous to count. All 4 were correctly characterized on both DWI and Gd-enhanced datasets. The remaining 12 patients had 27 metastatic lesions (mean size 1.3 cm, range 0.3-6.5 cm). 13 of the 16 patients with liver metastases were correctly identified on both DWI and Gd-enhanced T1 (sensitivity 81%). Performance of each technique is shown in the Table. DWI and Gd-enhanced T1 had equivalent sensitivity, DWI has a slightly lower specificity than Gd-enhanced T1. Of the 3 patients with liver metastases incorrectly characterized by both DWI and Gd-enhanced T1, 2 patients had a single necrotic metastasis interpreted as a benign lesion on both modalities. In the single patient incorrectly interpreted as having metastatic disease on DWI but correctly characterized on Gd-enhanced, the incorrectly characterized lesion was a focal nodular hyperplasia.

n = 25	DWI	Gd-enhanced
Sens.	0.81	0.81
Spec.	0.78	0.89
PPV	0.87	0.93
NPV	0.70	0.73
Accuracy	0.80	0.84

Performance of DWI and Gd-enhanced MR for detection of liver metastases (per patient)

Discussion:

The results of this study indicate that DWI has an accuracy approaching that of Gd-enhanced T1 for the correct identification of patients with liver metastases. DWI could potentially be used as an alternate non-contrast sequence for detection of liver metastases in patients with poor renal function.

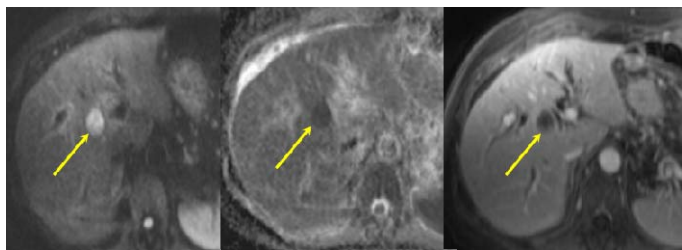


Fig.: 1.8 cm hepatic metastasis (arrow) identified on both DWI and Gd-enhanced T1 images, demonstrating high signal on DWI b=500 (left), decreased ADC (middle), and a hypovascular pattern on Gd-enhanced T1 (right).

Conclusion:

This preliminary study demonstrates the potential role of DWI as an alternate to contrast-enhanced sequences for the diagnosis of liver metastases in oncology patients in whom gadolinium is contraindicated.

References

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