

Value of diffusion weighted imaging (DWI) as an early imaging biomarker for prediction of therapy effect in patients with colorectal metastases following selective internal radiotherapy (SIRT)

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Introduction

Intraarterial administration of ⁹⁰Y microspheres is a promising radiation therapy for palliation in patients with colorectal liver metastases [1]. Immediate and long-term follow-up are necessary for determination of treatment response. Morphologic criteria used to detect tumor response traditionally rely on changes in tumor size assessed by conventional cross-sectional imaging, which may not be conclusive until 3 months after therapy [2]. Clinical studies revealed the potential of diffusion weighted imaging (DWI) as a sensitive early biomarker for predicting tumor response to therapy [3,4].

Material and Methods

41 colorectal liver metastases in 18 patients, age 62.9 +/- 9.9 years, were included in this study. All patients underwent MRI with standard imaging protocol, including administration of Gd-EOB-DTPA as well as echoplanar (EPI) DWI sequences. Imaging was performed prior to therapy (baseline MRI), 1 to 3 days after SIRT (early MRI) as well as 6 weeks later (follow-up MRI). Tumor volume (TV) and intratumoral apparent diffusion coefficient (ADC) were measured independently by two experienced radiologists at all time points. All metastases were categorized in responding lesions (RL) or non-responding lesions (NRL) according to increase or decrease in tumor volume after 6 weeks. Statistic analysis was performed using Wilcoxon- and Mann-Whitney-test. Statistical significance was presumed for p<0.05.

Results

33 lesions were evaluated as RL (TV 6.7 to 457.6 ml, mean 56.1 ml), 8 lesions as NRL (TV 5.8 to 85.1 ml; mean 27.0 ml). On follow-up MRI, TV decreased by 31.3 +/- 21.3% in RL (p<0.0001), which was accompanied by a significant increase of ADC by 21.4 +/- 16.4% (from 1.75 to 2.08 x 10⁻³ mm²s⁻¹; p<0.0001). TV increased in NRL by 49 +/- 31.9% (p=0.012) while ADC decreased by 9.9 +/- 10.7% (from 1.41 to 1.25 x 10⁻³ mm²s⁻¹; p=0.036). On early MRI, no significant change in TV was found for RL and NRL (p=0.53). In contrast, RL showed a significant decrease of ADC of 10.7 +/- 8.4 % (from 1.75 to 1.57 x 10⁻³ mm²s⁻¹; p< 0.0001). In contrast, NRL displayed an increase of ADC of 9.6 ± 20.8% (from 1.42 to 1.52 x 10⁻³ mm²s⁻¹) which was not significant (p=0.40). In addition mean ADCs of RL and NRL were significantly different at this time point (p<0.0001).

Conclusion

DWI is capable of early prediction of therapy effects in patients with colorectal hepatic metastases after radioembolization prior to morphologic changes in sectional imaging.

References

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