ABSTRACT SUBMISSION FORM

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PRESENTATION TITLE

Baseline dynamic R2* MRI in rectal cancer is associated with chemoradiotherapy outcome

AUTHOR(S)

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ABSTRACT

Purpose: In rectal cancer, the response to chemoradiotherapy (CRT) varies considerably depending on the aggressiveness of the tumour. The aggressiveness is amongst other factors linked to the presence of tumour hypoxia, and the functional MRI parameter R2* is suggested to be a non-invasive imaging biomarker of hypoxia. Our purpose was to investigate whether static or dynamic R2* MRI measurements can predict CRT outcome in rectal cancer.

Materials & Methods: Twenty-six patients with rectal cancer underwent baseline static T2*-weighted MRI with multiple echo times (TE) and dynamic susceptibility contrast (DSC)-MRI using a gadolinium-based contrast agent (Dotarem®) as part of a multi-echo dynamic acquisition, before CRT and surgery. To reduce bowel peristalsis, the patients received glucagon (intramuscularly) and Buscopan (intravenously). The static R2* (=1/T2*) was calculated from the multi-TE acquisition, whereas the peak R2* and the area under the R2* curve (R2*-AUC) were derived from the multi-echo dynamic data. Histopathologic CRT response was evaluated in the resected specimens by ypTN grading and tumour regression grade (TRG) scoring by the AJCC/CAP system, divided into good responders (TRG 0-1; n = 11) and poor responders (TRG 2-3; n = 15). Mann-Whitney U test was used to investigate associations between MRI parameters and CRT response, whereas Cox regression
evaluated differences in progression-free survival (PFS). The median follow-up in the cohort was 31 months.

**Results:** R2*-AUC from the dynamic acquisition significantly differentiated good and poor CRT responders at all post-contrast time-intervals, with increasing significance for increasing time-interval (p = 0.017 – 0.002). Poor responders had higher R2*-AUC values compared to good responders. For R2*-AUC up to 525 seconds receiver operating curve (ROC) analysis showed an AUC of 0.87 (95% confidence interval = 0.73 – 1.00, p < 0.001) with a sensitivity of 87% and specificity of 82%. The R2*-AUC also differentiated ypT0-2 from ypT3-4 status (p = 0.028). The high AUC_R2* was also related to poor PFS. The static R2* measurements gave no significant results.

**Conclusions:** R2*-AUC obtained from dynamic multi-echo MRI was significantly associated with CRT outcome in rectal cancer patients, with high R2*-AUC related to poor outcome. The results are currently under evaluation in a larger cohort that will be presented at the meeting. The results have potential to facilitate non-invasive treatment individualisation in rectal cancer.