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Title of Abstract: **Texture Analysis as a Predictive and Prognostic Biomarker of Tumoral Response to Neoadjuvant Chemoradiotherapy in Rectal Cancer Patients Studied with 3T MR**

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Modality: MR

Organ System: GI

Intro: Texture analysis is non-invasive method of assessing the heterogeneity within a tumor. Tumors with high intratumoral heterogeneity have been shown to have poorer prognosis, which could be secondary to intrinsic aggressive biology or treatment resistance.

Purpose: To determine if T2-weighted MR image texture features of rectal cancer can predict tumoral response in patients treated with neoadjuvant chemoradiotherapy.

Methods Used: Fifteen consecutive patients underwent pre- and post-treatment (6-8 weeks) MRI performed at 3T. Treatment protocol consisted of neoadjuvant chemoradiotherapy with oxaliplatin and 5-Fluorouracile. Texture was assessed within unenhanced axial T2-weighted images by manually delineating a ROI around the tumor outline for the largest cross-sectional area. Heterogeneity within this ROI was quantified using TexRAD, a commercially available research software algorithm that selectively filters and extracts texture at different anatomic scales (features of 2-6mm radius representing fine to coarse scales) with quantification of kurtosis (pointedness of distribution or histogram) and mean value of positive pixels (MPP). Surgical specimens were the gold standard.

Results of Abstract: Six patients showed complete pathological response (cPR) and 4 patients partial response (PR). Five patients were classified as non-responders (NR). A significant difference in baseline kurtosis was observed between cPR in comparison with PR+NR ($p=.01$). After treatment, a significant difference in kurtosis and MPP was observed between cPR and PR+NR ($p=.045$) and between cPR+PR and NR ($p=.041$) respectively. Relative change in kurtosis and MPP acted as prognostic biomarkers between cPR and PR+NR ($p=0.034$ and $p=0.045$ respectively) in addition to between cPR+PR and NR (MPP, $p=0.041$).

Discussion: Texture parameters derived from T2w images of rectal cancer have the potential to act as a predictive and prognostic biomarker of tumoral response to neoadjuvant chemoradiotherapy.

Scientific and/or Clinical Significance? Texture analysis of rectal cancer has the potential to identify non-responder patients at an early stage of neoadjuvant treatment who might be referred to alternative therapy.

Relationship to existing work New technique in rectal cancer evaluation to identify non-responder patients to neoadjuvant treatment.