Journal Article

Authors: Bundschuh, Ralph A; Dinges, Julia; Neumann, Larissa; Seyfried, Martin; Zsótér, Norbert; Papp, Laszló; Rosenberg, Robert; Becker, Karen; Astner, Sabrina T; Henninger, Martin; Herrmann, Ken; Ziegler, Sibylle I; Schwaiger, Markus; Essler, Markus

Title: Textural Parameters of Tumor Heterogeneity in 18F-FDG PET/CT for Therapy Response Assessment and Prognosis in Patients with Locally Advanced Rectal Cancer.

Abstract: (18)F-FDG PET/CT is effective in the assessment of therapy response. Changes in glucose uptake or tumor size are used as a measure. Tumor heterogeneity was found to be a promising predictive and prognostic factor. We investigated textural parameters for their predictive and prognostic capability in patients with rectal cancer using histopathology as the gold standard. In addition, a comparison to clinical outcome was performed. Twenty-seven patients with rectal cancer underwent (18)F-FDG PET/CT before, 2 wk after the start, and 4 wk after the completion of neoadjuvant chemoradiotherapy. In all PET/CT scans, conventional parameters (tumor volume, diameter, maximum and mean standardized uptake values, and total lesion glycolysis [TLG]) and textural parameters (coefficient of variation [COV], skewness, and kurtosis) were determined to assess tumor heterogeneity. Values on pretherapeutic PET/CT as well as changes early in the course of therapy and after therapy were compared with histopathologic response. In addition, the prognostic value was assessed by correlation with time to progression and survival time. The COV showed a statistically significant capability to
assess histopathologic response early in therapy (sensitivity, 68%; specificity, 88%) and after therapy (79% and 88%, respectively). Thereby, the COV had a higher area under the curve in receiver-operating-characteristic analysis than did any analyzed conventional parameter for early and late response assessment. The COV showed a statistically significant capability to evaluate disease progression and to predict survival, although the latter was not statistically significant. Tumor heterogeneity assessed by the COV, being superior to the investigated conventional parameters, is an important predictive factor in patients with rectal cancer. Furthermore, it can provide prognostic information. Therefore, its application is an important step for personalized treatment of rectal cancer.