AbstractID: 13808 Title: CT-perfusion and FDG-PET imaging in rectal cancer: new insights into tumor vasculature

CT-perfusion and FDG-PET imaging in rectal cancer: new insights into tumor vasculature

Purpose

The purpose of this study was to prospectively investigate tumor perfusion in rectal cancer and to determine early changes after hypofractionated radiotherapy. Furthermore, we correlated FDG uptake and tumor perfusion parameters intratumorally.

Method and Materials

Thirty patients diagnosed with rectal cancer were prospectively included in this study. All patients underwent FDG-PET and perfusion-CT imaging prior to the start of radiotherapy treatment. The perfusion-CT images were analyzed using the extended Kety-model, quantifying tumor perfusion with three parameters: K^{trans}, v_e and v_p. On the PET-images, the tumor was delineated using automated SUV-thresholding with the threshold (percentage of SUV_{max} within the tumor) depending on the tumor-to-background signal ratio. For each patient and for several tumor subregions, the mean and maximum FDG uptake (SUV) and tumor perfusion (K^{trans}) were quantified and correlated using the Spearman's rank correlation coefficient (ρ).

Results

The median tumors Ktrans values increased significantly after radiotherapy. Also, histogram analysis showed a shift of tumor voxels from lower Ktrans values towards higher Ktrans values. The median Ktrans values were significantly higher for tumor than for muscle tissue on both the pre-scan and the post-scan. In contrast, no differences between tumor and muscle tissues before and after radiotherapy were found for v_e and v_p. When correlating the tumors mean and maximum K^{trans} values to the corresponding SUVs, positive correlations were found. Also when correlating the mean and maximum perfusion and FDG uptake within the created tumor subregions, positive correlations were found.

Conclusion

Hypofractionated radiotherapy of rectal cancer leads to an increased tumor perfusion as reflected by an elevated Ktrans. FDG uptake was found to correlate with tumor perfusion assessed from dynamic perfusion-CT images. Highly perfused rectal tumors presented with higher FDG uptake levels when compared to relatively low perfused tumors.