AbstractID: 11269 Title: Pharmacokinetic Analysis of Hypoxia 18-Fluoromisonidazole Dynamic PET Imaging in Head and Neck Cancer

Purpose: This paper uses pharmacokinetic analysis of 18-Fluoromisonidazole (FMISO) dynamic PET imaging to investigate if there is any correlation between tumor hypoxia (K_i), tumor-to-blood ratio (T/B) in late-time image, local blood perfusion (k_1), and local vasculature fraction (β) for head-and-neck cancer patients. **Methods and Materials:** Newly diagnosed patients with head-and-neck cancer prior to chemotherapy or radiotherapy underwent dynamic FMISO-PET scan. The data was acquired in 3 consecutive PET/CT dynamic scan segments, with start acquisition time [0, 1, 2, 3, 4, 5, 10, 15, 20, 25, 90, 95, 180, 185] minutes, consisting of 5 frames in 1-minute frames, following by 5-minutes frames. The dynamic PET images were first registered with each other and then analyzed using Philips Research's Voxulus pharmacokinetic software. The (K_i, k_1, β) kinetic parameter images were derived for each patient. **Results:** Nine head-and-neck cancer patients' data were analyzed. Representative images of FDG-PET (showing the tumor), CT (showing the anatomy), late-time FMISO-PET (showing T/B), and (K_i, k_1, β) kinetic parameter images were shown consisting of a patient example with good concordance of tumor hypoxia and high T/B, one with concordance of no tumor hypoxia and low T/B, and one with ambiguity between tumor hypoxia and T/B. Scatter diagrams were plotted between each pair of T/B, K_i, k_1, β and corresponding correlation coefficient computed. **Conclusions:** There is strong positive correlation between ROI's T/B and hypoxia index K_i. However, due to the statistical photon counting noise in PET imaging, and the amplification of noise in kinetic analysis, the direct correlation between individual pixel's T/B and hypoxia is not obvious. For a tumor ROI, there is slight negative correlation between k_1 and K_i, moderate positive correlation between β and K_i, but no correlation between β and K_i.

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