AbstractID: 9784 Title: Hypoxia-Guided Intensity-Modulated Radiation Therapy for Head and Neck Cancer

Purpose: Hypoxia renders tumor cells radioresistant; limits locoregional control(LRC) from radiation therapy. IMRT allows targeting of the gross tumor volume(GTV) and can potentially deliver a higher dose to hypoxic subvolumes(GTV_h) while sparing normal tissues. This study examines the feasibility of ^{18}F-FMISO PET/CT-guided IMRT with the goal to maximally escalate the dose to radioresistant hypoxic zones in a cohort of HNCA patients.

Materials and Methods: ^{18}F-FMISO was administered IV for PET imaging. CT simulation, FDG PET/CT, and ^{18}F-FMISO PET/CT scans were co-registered using the same immobilization. Tumor boundaries were defined by clinical examination and available imaging including FDG PET/CT. Regions of elevated ^{18}F-FMISO uptake within the FDG PET/CT GTV were targeted for IMRT boost. Additional targets/normal structures were contoured/transferred to treatment planning to generate ^{18}F-FMISO PET/CT-guided IMRT plans.

Results: The heterogeneous distribution of ^{18}F-FMISO within the GTV demonstrated variable levels of hypoxia within the tumor. Plans directed at performing
^{18}F-FMISO PET/CT-guided IMRT for 10 HNCA patients achieved 84 Gy to GTV_h, 70Gy to GTV, without exceeding normal tissue tolerance. We further attempted to deliver 105 Gy to GTV_h for two patients and were successful in one with normal tissue sparing.

Conclusion: It was feasible to dose escalate GTV_h to 84 Gy in all 10 patients and in one patient to 105 Gy without exceeding normal tissue tolerance. This information provided important data for subsequent hypoxia-guided IMRT trials with the goal of further improving LRC in HNCA.