

AbstractID: 3764 Title: Preferential non-uniform target dose distribution using IMRT and PET/CT imaging- a feasibility study

Purpose: To investigate the feasibility of planning non-uniform dose distribution based on FDG PET uptake within target and its impact on normal tissue structures using IMRT.

Method and Materials: An IMRT treatment planning study was performed on a patient with colon metastasized liver cancer to investigate the effect of the non-uniform target dose on the normal structures. Tumor and normal tissue such as liver, right kidney and cord were outlined on the CT scans registered with PET images. Two IMRT plans were generated for evaluation. In plan A, tumor was prescribed uniform dose of 50 Gy. In plan B, dose to the tumor periphery that showed mean SUV uptake four times the tumor core was increased to 100 Gy. Normal liver dose constrain was set such that 30% of the liver receives less than 30 Gy. The maximum spinal cord and right kidney doses were constrained to 45, and 30 Gy respectively, in both plans.

Results: Plan A met the prescribed dose constrains with six beams. Dose to tumor was within 5% of the prescribed dose. However, the number of beams had to be increased to nine to meet the dose constrains in plan B. In this plan while 30% of the normal liver was still receiving less than 30 Gy, dose to 50% of liver was increase from 10 Gy to 20 Gy. Also, maximum spinal cord that was 20 Gy in plan B, was increased to 40 Gy in plan B. The right kidney doses were virtually unchanged in both plans. Although partial doses to liver and spinal cord were increased in plan B but they were still below the tolerances for these organs.

Conclusion: This study showed that in this particular case dose to biologically active tumor subregion could be increased considerably without exceeding normal tissue tolerances.