AbstractID: 14356 Title: FDG-PET based local dose effect relation for oesophageal toxicity in lung cancer patients

Purpose: Lung cancer patients undergoing concurrent chemoradiation (CRT) using IMRT frequently develop severe (≥grade 3 CTCAEv3.0) acute radiation oesophagitis. The purpose of this work was to correlate the planned dose distribution with the post-CRT local oesophageal FDG-PET uptake as a surrogate for oesophageal toxicity.

Materials and methods: Ten patients with non small cell lung cancer (5 patients with grade 1-2, and 5 with grade 3 toxicity) were included in this study. For each patients, the oesophagus was within the PTV and an FDG-PET/CT scan was performed approximately 30 days post-CRT. Patients were treated with IMRT, 24x2.75Gy with daily cisplatin and weekly cetuximab. The planned dose was sampled on the oesophageal-surface, after the dose was corrected for fractions of 2Gy (EQD2) with an α/β-ratio of 10Gy. The post-treatment PET standard uptake values (SUV) were sampled on the oesophageal-surface following image registration to establish the oesophageal dose-to-SUV relationship. The oesophageal dose-surface histogram and mean, max50% and max10% SUV were calculated for each patient, and compared between the 2 groups. Finally, a dose–effect relationship was fitted by the sigmoid-shaped Lyman-model.

Results: The mean, max50% and max10% SUV were significantly higher in the grade 3 group compared to the grade 1-2 group (2.7-2.1 (p=0.04);3.5-2.5 (p=0.03);5.0-3.0 (p=0.01);1-sided t-test). A local dose-effect relationship was found with TD50=76Gy and steepness parameter 0.25. Oesophageal dose differences between the grade 3 and grade 1-2 were mainly observed above 60Gy.

Conclusions: This study indicate that elevated SUV post-CRT in the oesophagus is correlated with severe acute oesophageal toxicity and a clear dose-effect relation was observed with SUV mostly increasing at EQD2 levels above 60 Gy. Overall response parameters and refinements of treatment planning dose constraints are subject of further study.