AbstractID: 13107 Title: Evaluation of Volumetric Losses during Radiation Therapy Using Image Guidance of Electronic Portal Imaging Device

Purpose: Changes in patient volume, due to tumor shrinkage, dehydration, dysphagia and atrophy, could present issues in the accuracy of dosimetry throughout the course of treatment. The aim of this work is to study the dosimetric impacts of the volumetric changes during IMRT and to investigate the feasibilities of electronic portal imaging device (EPID) in predicting the impacts. **Materials and Methods:** An anthropomorphic head and neck phantom was used to represent two scenarios: symmetric and asymmetric volume loss. The phantom was simulated and planned according to the head and neck protocols used in our clinic. Dose volume histograms (DVH) were generated for each set up scenario, comparing the dose expected at the coincident volume of the phantom. During treatment delivery, the EPID captured exit fluence of each beam at each level of bolus thickness. These images were quantitatively analyzed using gamma analysis with criteria of 3% and 3mm dose difference and distance-to-agreement respectively. **Results:** Comparing maximum to minimum volume in the symmetric situation with DVH generated in Eclipse show fluctuations in dose. Maximum dose to the planning target volume (PTV) increased by 9.3%. In addition, increases to organs at risk ranged from ~4% to 7.3%. The asymmetric volume change predicted dose fluctuations that were less significant with the largest dose increase < 4% in the PTV. As for gamma analysis, a quantitative evaluation showed extreme variability in the images with five layers of bolus when compared to images with no bolus. Less significant variation was shown in layers of closer thicknesses, as expected. **Conclusions:** The phantom study indicates that volume loss could contribute to clinically considerable changes in the dose delivered to target and organs at risk. The proposed technique using EPID could provide valuable information about the variation of dose due to volumetric changes and might be potentially useful.