AbstractID: 14173 Title: Estimation of Boost Dose Required to Compensate for High FDG Uptake in Head and Neck Squamous Cell Carcinoma

Purpose: Although high FDG regions are recognized as a possible target for boost dose escalation, there is no clear basis for selecting the boost dose. Based on available published data, we make an estimate of the range of extra dose required to equalize local control between FDG-avid and non-avid tumors.

Method and Materials: A literature review was performed for radiation therapy (RT) for head and neck squamous cell carcinoma (HNSCC), in which RT-only outcomes were compared for high and low FDG uptake groups. Among nine relevant trials, only three provided adequate data for analysis. Either local control or disease free survival were used to estimate Tumor Control Probability (TCP). A logistic TCP model was used. Values of TD_{50} were found for each group with three different γ_{50} values (γ_{50}=1, 2 or 4), with 2 thought to most likely represent clinical reality. The dose required for the high SUV_{max} group to achieve the same level of TCP can be directly calculated from the ratio for any TCP level, since the slope was assumed to be the same for both groups. The ratio of TD_{50}'s for high SUV_{max} group and low SUV_{max} group ($TD_{50,high}/TD_{50,low}$) was calculated.

Results: Estimated $TD_{50,high}/TD_{50,low}$ ratios were found to be in the range of 1.11~2.06, with decreasing values as the presumed value of γ_{50} increased up to 4. With γ_{50}=2, the derived ratios of ($TD_{50,high}/TD_{50,low}$) were 1.22, 1,23, and 1.44.

Conclusion: The boost dose mostly likely required to compensate for radioresistant FDG-avid tumors is estimated to be 84-98 Gy, assuming a non-boost dose of 70 Gy, although values between 77 Gy and 140 Gy cannot be ruled out. These estimates provide a rational starting point for clinical trials to test the usefulness of IMRT boots FDG-avid tumors.

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