

AbstractID: 9250 Title: Volume-based Isoeffective Dose Calculations for Hypofractionation and the Analysis of Critical Structure Limits with Respect to Known Toxicity Frequencies

**Purpose:** Image guidance and active tracking may lead to PTV reductions allowing for hypofractionation and dose escalation in some disease sites. Variations in total dose and dose/fraction to the normal structures at risk presents difficulties in establishing limits relative to known toxicity rates. In this work we describe a method allowing changes in dose schedules while predicting the appropriate normal tissue limits.

**Method and Materials:** At this institution rectal limits for IMRT delivery to the prostate to 76Gy at 2Gy/fx are set such that no more than 17% and 35% of the rectal volume receives greater than 65Gy and 40Gy and are based on prior randomized studies and arbitrarily, respectively. These values have been utilized in an in-house, randomized, hypofractionation trial comparing the above fractionation scheme to 2.7Gy/fx to 70.2Gy (1). Two year rectal toxicity data have been analyzed. A follow-up protocol utilizing IGRT and tracking as well as reduced PTV margins will employ fractionation schemes of 2Gy/fx to 84Gy (2) and 2.7Gy/fx to 78.3Gy (3). Using the equivalent dose at 2Gy/fx (EQD2), alpha/beta ratios of 2.0Gy and 4.0Gy for the prostate and rectum, respectively, and fixing the rectal analysis volume to 17% and 35%, we are able to determine the appropriate rectal limits for varying fractionation schedules.

**Results:** Values for 17% and 35% in scheme (1) above are 59.2Gy and 37.2Gy. Values for scheme (2) are 66.5Gy and 40.7Gy. Values for scheme (3) are 60.9Gy and 38Gy.

**Conclusion:** PTV reductions may decrease the area of overlap into adjacent critical structures. Combined with the inherent conformality of IMRT the resulting critical structure dose distributions may be represented by lower fractional doses leading to uncertainties in correlating with known toxicity rates. By fixing the analysis volume and converting this minimum dose to 2Gy equivalents we may lessen these uncertainties.