

AbstractID: 4381 Title: The Significance of Higher Dose Rates for Stereotactic Body radiation Therapy

The dose rate effect (DRE) has been much studied in the past, but has been less investigated in the simultaneously high fractional dose (HFD) and high dose rate (HDR) regime. These are circumstances akin to stereotactic body radiation therapy (SBRT) treatments. We have studied the possible significance of higher dose rates for SBRT fractionation regimens by analyzing model predictions based on the extensions of the linear quadratic (LQ) model and the lethal-potentially lethal (LPL) model. Previously reported data for seven human tumor cell lines have been used in this analysis. We have also analyzed possible modifications due to oxygenation for mixed populations of oxic and hypoxic cells. We have found that considerably higher cell kill levels are predicted to occur in the HFD and HDR regime for most of the cell lines that we have studied for both uniformly oxic and mixed cell populations. These model predictions suggest that some human tumor cells may exhibit significantly higher radiosensitivity in the HFD and HDR regime. This is pertinent to the implementation of SBRT and its fractionation regimens and, if shown to persist clinically, could lead to significantly higher tumor control.