AbstractID: 3529 Title: In Vitro Measurement of the Repair Time for Prostate Cancer

Purpose: It is concerned that the prolonged delivery time of IMRT may affect the treatment effectiveness. For prostate cancer, biological modeling suggests that the effectiveness of IMRT could be degraded by over 10% when the repair half-time is short compared to the fraction delivery time. Published data show that repair half-time for prostate cancer may be as short as 10 minutes or as long as a few hours. The purpose of this study is to measure the repair half-time of prostate cancer cells with split-dose experiments *in vitro*.

Method and Materials: We performed a series of single-fraction and split-dose experiments with the DU-145 cell line, which is derived from human prostate cancer, and analyzed the data using the linear-quadratic (LQ) model. The study is presented in two parts: (1) estimate the LQ parameters (α and α/β) from high-dose-rate survival data (0 to 12 Gy) and (2) determine the repair half-time from split-dose experiments (4 Gy + 4 Gy and 6 Gy + 6 Gy) with time intervals ranging from 6 minutes to 8 hours.

Results: Preliminary analysis of our pilot data shows that DU-145 cells are very radiosensitive with a large α/β ratio ($\alpha = 0.52$ Gy^{-1} and $\alpha/\beta = 11.5$ Gy). The repair half-time derived from the split-dose data is 18 minutes and the estimated standard confidence interval is between 16 to 19 minutes. No component of repair half-time over one hour has been detected.

Conclusion: The sublethal damage repair of DU-145 prostate cancer cells is very rapid with a repair half-time less than 20 minutes, which is consistent to the repair half-time of 16 minutes derived from clinical data in a previously reported study. Our preliminary results needs to be verified in the follow-up experiments.

Conflict of Interest (only if applicable): N/A