AbstractID: 11345 Title: Pulsed reduced dose-rate intensity modulated radiotherapy (IMRT) delivery for use in the high dose re-irradiation setting

Purpose: Pulsed reduced dose-rate radiotherapy (PRDR) in the re-irradiation setting has been reported in the literature. In an effort to reduce normal tissue toxicities a series of 0.2Gy pulses separated by 3 minute intervals are delivered for a time-averaged dose rate of approximately 0.06Gy/min. We have combined PRDR with IMRT for increased conformality and normal tissue sparing. The purpose of this work was to explore the efficacy of this pairing.

Method and Materials: The case presented represents a 31 year old patient with recurrent pancreatic cancer, previously treated with 3DCRT to 50.4Gy. Re-irradiation of a 153cc PTV was planned to deliver 50Gy in 25 fractions via a 14 field, non-coplanar IMRT plan on a Varian Trilogy, resulting in a total dose of 100.4Gy to parts of the target volume. The IMRT plan was delivered through 385 segments and 565 MU via the step-and-shoot method. MU linearity and a fluence map profile comparison were evaluated for both high and low dose rate settings. Due to the large number of low MU segments the treatment was delivered at 100MU/min to promote beam stabilization. A time-averaged dose rate of approximately 0.06Gy/min was arrived at by inserting a 2 minute and 23 second time interval between the initiation of delivery for each beam.

Results: The percentage of segments delivered using fractional MU between 1-2, 2-3, and 3-4 were 95.6%, 3.4% and 0.3%, respectively. Measured absolute dose and spatial distribution agreed to within 0.1% and within 3%/3mm DTA, respectively.

Conclusions: A minimum of 10 beam directions are used to ensure relatively smooth intensity maps, adequate normal tissue sparing and that no aspect of the target volume is un-irradiated for 2 consecutive pulses. With normal tissue sparing being the dominant endpoint for PRDR, IMRT is shown to provide an optimal and accurate delivery mechanism.