AbstractID: 12806 Title: Lack of dose rate effect with ultra-high dose rate irradiation of normal tissue fibroblasts and RT112 tumour cells

Purpose: Radiation biology studies have previously investigated the effects of dose rate on in vitro clonogenic survival in numerous cell lines. The effect on cells from ultra-high dose rates (>1Gy/sec, have not been reported. The motivation of this work was to confirm the iso-effectiveness of photon radiation at a dose rate of up to 4Gy/sec in vitro on normal tissue and tumour cell lines.

Methods: *Tissue Culture:* RT112 bladder tumour cells[1] and BS2 skin fibroblasts were grown in standard aseptic conditions, irradiated and left for 2 weeks to form colonies which were then stained and counted. *Cell irradiation:* Ultra-high dose rate irradiation (4Gy/sec) was achieved using a 10MeV Linear accelerator with a reduced FSD. A 300KV orthovoltage unit for conventional dose rate (1Gy/min) exposures. An RBE correction of 1.1 was applied to the orthovoltage exposures.

Results: Figure 1 shows the results from RT112 tumour cells and BS2 fibroblasts cells irradiated with conventional 1Gy/minute alongside results from the ultra-high-dose rate (4Gy/second) irradiation. Each set of data has been fitted using the linear-quadratic model and demonstrate no significant effect for dose rate on cell survival. The implications of these finding are that very high dose rates could be used without any negative or unexpected effects on the predicted cell kill.

Conclusions: This work demonstrated no significant effect for changes in dose rate in the range from 1Gy/minute to 4Gy/second in both tumour and normal tissue cell lines. Delivery of highly modulated IMRT plans leads to an increased delivery time, with potentially deleterious effects with regard to patient and organ motion, hence the clinical need to develop higher dose rate delivery systems. This work would support the safety of higher dose rate delivery systems in clinical practice.

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