

AbstractID: 13173 Title: Theoretical and experimental determination of therapeutic advantage of single fraction Megavoltage Grid Therapy for F98 Glioma brain tumor cell lines

The hypofractionated megavoltage grid-therapy is an effective treatment for management of bulky tumors with radiation. The main merit of this technique is that it takes advantage of the ability of normal tissue to repair better than tumor cells after radiation damage. Grid therapy deliberately creates cold spots that spare normal tissues, which can serve as centers of regrowth while the hot spots created by this therapy kill the tumor cells. Grid therapy also increases radiation dose tolerance and reduces the side effects. However, because the grid field is highly non-uniform, there is currently no treatment planning system that can handle dose calculation. The only recourse is Monte Carlo simulation. A Monte Carlo technique was employed to calculate dose distribution of a commercially available grid collimator. The linear-quadratic (LQ) model was used to evaluate the therapeutic outcome of a list of the single fraction treatments using grid therapy to treat F98 Glioma tumor cell line. F98 cell line was represented by a set of radio-biological response parameters measured in our lab. The tumor cell and normal tissue survival statistics of grid therapy for open and grid field were calculated using the 3-D dose distributions obtained by Monte Carlo technique, and the therapeutic ratios and equivalent open field doses were derived. Our in-vitro experiments using the grid and uniform open field also indicated that the grid field could significantly increase the sensitivity of F98 cell lines to the radiation. In all the single fraction treatments, the therapeutic ratio depends on the fraction dose and tumor size; there is a significant therapeutic advantage of grid therapy for treating the studied Glioma cell line. The therapeutic advantage of the megavoltage grid therapy is demonstrated clearly by both the experimental measurements and theoretical calculations.