

AbstractID: 8795 Title: A method of delivering a low dose fraction using a TomoTherapy unit

Purpose:

To create a method of delivering PRDR for re-irradiation of large brain tumors on the TomoTherapy Hi-ART® system

Method and Materials:

Pulsed Reduced Dose Rate (PRDR) delivers a standard 2Gy fraction delivered over ten 0.2Gy sub-fractions with a 3 minute break between sub-fractions to give a time averaged dose rate of 4Gy/hr. The accelerator on a tomotherapy unit has a fixed output rate of 8Gy/min. If the dose per fraction is conventionally planned at <0.6Gy/fraction, the result is a clinically unacceptable DVH. Our method involves a virtual grid style blocking scheme, where half of the beam angles are blocked using 15 equally spaced directional segments surrounding the center of the image set.

Ten patients treated using conventional PRDR with an average PTV volume of 344cc were retrospectively re-planned using five techniques (standard 2Gy fraction, 2Gy in 0.2Gy fractions without grid blocking, two grid patterns, and a combination dataset incorporating both grids) and analyzed with conformation numbers (CN), homogeneity indexes (HI), and dose volumes to normal tissues. Plans were optimized using equal constraints and machine parameters.

Results:

Our method allowed for clinically acceptable treatment plans at 0.2Gy with a treatment time ≤ 3 min per subfraction. The average HI was slightly poorer for the combination plan versus the standard 2Gy fraction (0.064 versus 0.027) and the CN was similar over all techniques (0.72-0.73). Normal tissue dose volumes for each patient were also similar for each technique. Initial ion chamber measurements agree with predicted values for a 0.2Gy subfraction.

Conclusion:

PRDR is deliverable on a TomoTherapy system using a virtual blocking method. Results can be slightly improved through the use of two grids alternated on a daily basis. The dose to normal structures for individual patients was similar for all methods.

Conflict of Interest: The author has a financial interest in TomoTherapy Inc.