AbstractID: 9082 Title: Tissue Heterogeneity Effects On Radiation Dose To Small Lung Lesions With Extra-Cranial Radiosurgery

The BrainLAB Novalis utilizes a 6-MV x-ray beam to irradiate lesions throughout the patient's body. The lung lesions, which can be as small as 1 cm in diameter, are the same density as the soft tissues in the body. However, the lung is typically one-third the density of other tissues. Consequently the recoil electrons have range three times greater in lung than the range in normal tissue. This leads to dose perturbations of the dose distribution delivered by megavoltage x-ray beams. This study measures the perturbation of tumor dose caused by the tissue heterogeneity and compares the data with three calculation algorithms used in treatment planning dosimetry. The beam then transits through the pleural lining and is incident on the lung with the 0.3 grams per cubic centimeter density. In the tissue interface of the chest wall and lung, the recoil electrons are reduced in the lung and one sees a build-down of lung dose. At the lung-tumor interface one sees a modest build-up of recoil electrons and a concurrent build-up of the tumor dose. The effect of the perturbation at this beam energy is on the order of 6-8% reduction of the dose delivered to the tumor periphery as compared with the dose calculated by the BrainSCAN pencil beam algorithm. PINNACLE and PERRIGRINE calculations reproduced the lung phantom film dosimetry. The dose reduction should be accounted for in the standard fractionation schedules by correspondingly increasing the isocentric dose delivery.

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