

Prior dose escalation and altered fraction studies have shown that local control can be improved with increasing doses of radiotherapy. The main limiting factor in escalating doses in lung cancer treatment is the development of radiation pneumonitis. The goal of this work is to use intensity-modulated adaptive radiation therapy with daily CT based image guidance to reduce the amount of normal lung tissue receiving 20 Gy. Megavoltage CT (MVCT) images taken prior to the treatment of lung cancer patients on a HI-ART<sup>2</sup> Helical Tomotherapy have shown a 200% to 500% reduction in gross tumor volume (GTV) volume during the course of therapy. The reduction in gross tumor volume can result in the excessive irradiation of normal lung tissue. Conventional radiation therapy (including 3D and IMRT) adds margin around the GTV to account for microscopic disease, daily setup error, and organ motion. This volume, called the Planning Target Volume (PTV) is typically assumed to have a constant size for at least the first 40 to 50 Gy. However, as the tumor reduces in size during treatment the margin added around the GTV effectively gets larger. Additional work was done by reducing the PTV volume weekly based on the previous 5 MVCT image sets resulting in a reduction of the amount of irradiated normal tissue. With weekly adaptive therapy, the volume of ipsilateral lung receiving 20Gy could have been reduced to 55 and 17 percent for the two patients in this initial study.

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