AbstractID: 2465 Title: Image-Guided Adaptive Therapy for Lung Cancer

Purpose:
Because the GTV for many lung cancer patients decreased during the course of treatment, the margin effectively gets larger as the tumor reduces in size. This work describes the development and assessment of a technique for image-guided adaptive radiation therapy for lung cancer.

Method and Materials:
Megavoltage CT (MVCT) images of the GTV were acquired daily on a helical tomotherapy system. These images were used to position the patient and to measure reduction in GTV volume. A planning study was conducted to determine the amount of lung-sparing that could have been achieved if adaptive therapy were utilized. Treatment plans were created where the target volumes were reduced following measured tumor reduction.

Results:
A total of 158 MVCT imaging sessions have been performed on 7 lung patients. The GTV reduced by 60 to 80% during the course of treatment. The tumor reduction in the first 60 days of treatment can be modeled using the 2nd order polynomial $R = 0.0002t^2 - 0.0219t + 1.0$, where (R) is the percent reduction in GTV and (t) is the elapsed days. Based on these treatment-planning studies, the absolute volume of ipsilateral lung receiving 20 Gy can be reduced between 5 and 25 percent (*17%* mean) by adapting the treatment delivery. The benefits of adaptive are the greatest for tumor volumes ≥ 25 cm^3 and are directly dependent on the GTV reduction during treatment.

Conclusion:
MVCT based image-guidance can be used to position lung cancer patients daily. This has the potential to decrease margins associated with daily setup error. Furthermore, the adaptive therapy technique described in this work can decrease the volume of healthy lung tissue receiving above 20 Gy.

Conflict of Interest:
Research supported by TomoTherapy, Inc.