

Respiratory motion pattern analysis of lung cancer patient with gated treatment: A preliminary study

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Purpose:

An external surrogate, represent respiratory tumor motion, based respiratory gating technique is a useful method for the treatment of a moving lung tumor. The success of this technique relies on the repeatability of the respiratory motion. The purpose of this study is to analyze external surrogate motion traces in actual treatment situations and to evaluate respiratory pattern of lung cancer patient as intent of radiation treatment.

Materials and Methods:

All Respiratory motion data during gated treatment were saved as a waveform signal in Real-time Position Management (RPM, Varian Medical Systems, Palo Alto, CA) system. These signals were exported as a *.txt file files contain upper and lower threshold phase, position of surrogate during treatment and a moment of beam enable/disable. The respiratory motion patterns of each patients, baseline shift, average breathing period, deviation of breathing amplitude for all treatment fractions were analyzed with in-house program.

Results:

The real-time respiratory motion data, baseline shift, average breathing period, deviation of breathing amplitude, from RT alone, chemo RT and pre- and post-operative gated radiation therapy with LINAC(TruebeamTM, VitralbeamTM, Varian) were analyzed in this study.

Respiratory motion, total treatment time and duty cycle for every treatment fraction were also analyzed. The treatment time is typically greater than 2 min in gated treatment and 25 min in SBRT treatment. The baseline shift, which affects largest impact on treatment success, was increased with total treatment time increases.

Conclusions:

This study shows inter-/intra- fractional variation and respiratory pattern comparison as intent of radiation therapy for lung cancer treated with gating technique. This analyzed respiratory pattern data of lung cancer with gated technique potentially provide the necessity of motion management in respiratory motion-based radiation treatment.

Keywords: Lung cancer, Respiratory gating