

AbstractID: 2865 Title: Comparison between Free Breathing, Slow and Respiratory Correlated CT in Radiation Treatment Planning for Lung Cancer Patients.

**Purpose:**

Radiotherapy for lung cancer requires a margin for internal movement of the tumor. Reduction of this margin and thus dose escalation may be possible by using a slow or a respiratory correlated CT (RC-CT) during radiation treatment planning. In this study these two novel methods are compared to the use of a conventional free breathing CT (FB-CT).

**Method and Materials:**

On a modified Siemens Sensation 10 an FB-CT and an RC-CT scan were acquired in nine patients. The RC-CT scan was used to measure tumor motion and to reconstruct a CT at 10 respiratory phases (10p-CT). One of these was termed the mid-ventilation CT (MV-CT) and by averaging all CTs, a slow-CT could be reconstructed. Four treatments were planned based on the FB-CT (with conventional internal margin); the slow CT; the 10p-CT, and the MV-CT (with an internal margin of (motion amplitude)/4). Mean tumor dose was calculated for these four plans for a fixed mean lung dose of 15Gy. The possibility of coldspots (<95%) was investigated by determining minimum tumor dose that occurred during respiration.

**Results:**

The mean tumor dose in the FB-CT based plan was 74Gy, for the MV-CT 100Gy, for the 10p-CT 95Gy, and for the slow-CT 101Gy ( $p=0.0001$  for FB-CT vs. other;  $p=0.12$  for MV-CT vs. 10p-CT). Coldspots occurred in the patient with the largest tumor motion (15mm amplitude) in the case of a plan based on a slow-CT scan.

**Conclusion:**

Since radiation treatment planning based on a slow-CT can lead to underdosage in tumors moving with a large amplitude and the delineation of the 10p-CT is rather cumbersome, we conclude that using an RC-CT scan to reconstruct a mid-ventilation CT and applying a margin of one quarter the tumor motion amplitude, is the most suitable method for radiation treatment planning in lung cancer patients.