Purpose: To evaluate the dose delivery retrospectively after treatment using breathing sessions recorded during the treatment.

Methods: Two lung cancer patients were given 22 and 25 respiratory sessions for imaging and treatment. A computational model was developed in past for calculating dose delivered to a moving target, given a planned dose distribution. We have determined ITV from the breathing traces acquired during CT using 30-to-70 and 35-to-75% phase windows, respectively, for the two patients. We used the same window within the traces acquired during treatment for dose reconstruction (the windows were given as tagged traces). The ITV margins were determined using first the difference between the maximum and minimum amplitudes within the windows and second the 95%-confidence interval of the difference from the entire patterns from CT. We added the second option as we could not locate the portion of the breathing traces that corresponds to the CT slices of tumor, while these slices are used for moving-target contouring. So, using the entire pattern tends to overestimate internal margins. The magnitude of CTV was assumed to be 3 cm; the planned dose was justly covering PTV boundaries. The delivered dose profiles calculated for treatment sessions were compared to the planned distribution.

Results: Using the determined ITV from the CT session, the CTV and normal tissue coverage were calculated. The CTV coverage was 100% for all sessions except one for patient A. For the patient B, the sessions which deliver the prescription dose to 100% of the CTV volume was 25% of the entire sessions. Almost all (23/24) sessions delivered 95% of the prescription dose to 95% of the CTV volume, affected by less reproducible breathing patterns than the patient A.

Conclusions: We reconstructed the dose coverage in CTV and normal tissue within ITV. This study could help determine PTV margins.

Funding Support, Disclosures, and Conflict of Interest:

In part supported by Varian medical systems, Inc and in part supported by the National Research Foundation of Korea(NRF) grant funded by the Korea government(MEST) (No. 2009-0085999) and by the Industrial Strategic technology development program : 10035527 funded by the Ministry of Knowledge Economy(MKE, Korea)