Purpose: To assess the reliability of soft tissue alignment by comparing pre- and post-treatment cone-beam CT (CBCT) for image guidance in stereotactic body radiotherapy (SBRT) of lung cancers.

Methods: Our lung SBRT procedures require all patients undergo 4D CT scan in order to obtain patient-specific target motion information through reconstructed 4D data using the maximum-intensity projection (MIP) algorithm. The internal target volume (ITV) was outlined directly from the MIP images and a 3-5 mm margin expansion was then applied to the ITV to create the PTV. Conformal treatment planning was performed on the helical images, to which the MIP images were fused. Prior to each treatment, CBCT was used for image guidance by comparing with the simulation CT and for patient relocalization based on the bony anatomy. Any displacement of the patient bony structure would be considered as setup errors and would be corrected by couch shifts. Theoretically, as the PTV definition included target internal motion, no further shifts other than setup corrections should be made. However, it is our practice to have treating physicians further check target localization within the PTV. Whenever the shifts based on the soft-tissue alignment (that is, target alignment) exceeded a certain value (e.g. 5 mm), a post-treatment CBCT was carried out to ensure that the tissue alignment is reliable by comparing between pre- and post-treatment CBCT.

Results: Pre- and post-CBCT has been performed for 7 patients so far who had shifts beyond 5 mm despite bony alignment. For all patients, post CBCT confirmed that the visualized target position was kept in the same position as before treatment after adjusting for soft-tissue alignment.

Conclusions: For the patient population studied, it is shown that soft-tissue alignment is necessary and reliable in the lung SBRT for individual cases.