Purpose: Radiologic lung density changes are observed during radiotherapy for lung cancer. We studied the relationship between dose and computed tomography (CT) density changes during the treatment, a prediction for lung radiation pneumonitis.

Methods: 30 Stage â…¢ lung cancer patients with CRT were thirty fractions of 2.0 Gy, prescribed at the 90% isodose. Follow-up CT scans performed at less than 3 weeks (n=15) and between 3 and 6 weeks (n=15) after CRT radiotherapy were reviewed. New CT scans were coregistered with baseline scans using CT-CT normalized mutual information registration algorithm. Voxel-Hounsfield unit histograms were created for doses between 0.5 and 50 Gy. Linear mixed effects models were used to assess the effects of CRT dose on CT density, and the influence of possible confounders was tested.

Results: Increased mean CT density was associated with higher dose, increasing planning target volume size, and increasing time after CRT (all p <0.05). Density increases were apparent in areas receiving 20 Gy, but seemed to plateau above 40 Gy. In regions receiving >30 Gy, the reduction in air-filled fraction of lung during treatment was up to 20%. No increase in CT density was observed in the contralateral lung receiving less than 5 Gy.

Conclusions: A dose-response relationship seems to exist for quantitative CT density changes during CRT radiotherapy. The density between old and new CT during the treatment could be a prediction for lung injury.