Purpose: To compare esophageal dose distributions in esophageal sparing IMRT plans with predicted dose distributions which include the effect of inter-fraction motion.

Methods: Seven lung cancer patients were used, each with a standard and an esophageal sparing plan (74Gy, 2Gy fractions). The average max dose to esophagus was 8351cGy and 7758cGy for the standard and sparing plans, respectively. The average length of esophagus for which the total circumference was treated above 60Gy (LETT60) was 9.4cm in the standard plans and 5.8cm in the sparing plans. In order to simulate inter-fractional motion, a three-dimensional rigid shift was applied to the calculated dose field. A simulated course of treatment consisted of a single systematic shift applied throughout the treatment as well a random shift for each of the 37 fractions. Both systematic and random shifts were generated from Gaussian distributions of 3mm and 5mm standard deviation. Each treatment course was simulated 1000 times to obtain an expected distribution of the delivered dose.

Results: Simulated treatment dose received by the esophagus was less than dose seen in the treatment plan. The average reduction in maximum esophageal dose for the standard plans was 234cGy and 386cGY for the 3mm and 5mm Gaussian distributions, respectively. The average reduction in LETT60 was 0.6cm and 1.7cm, for the 3mm and 5mm distributions respectively. For the esophageal sparing plans, the average reduction in maximum esophageal dose was 94cGy and 202cGy for 3mm and 5mm Gaussian distributions, respectively. The average change in LETT60 for the esophageal sparing plans was smaller, at 0.1cm (increase) and 0.6cm (reduction), for the 3mm and 5mm distributions, respectively.

Conclusions: Interfraction motion consistently reduced the maximum doses to the esophagus for both standard and esophageal sparing plans.