Purpose: To investigate correlation of standard-uptake values (SUV) from post-treatment PET imaging representing clinical complications such as muscular inflammation with dose delivered in non-small cell lung cancer patients treated with large hypo-fractions using stereotactic body radiation therapy (SBRT).
Materials and Methods: Clinical complications represented as chronic inflammation and rib fractures in ten non-small cell lung cancer patients treated with large hypo-fractionated stereotactic body radiation therapy were investigated. SBRT was delivered in three fractions with each fraction 20 Gy or five fractions with each 12 Gy. These patients were scanned with PET imaging at three and seven months after treatment for follow up to evaluate tumor control and clinical complications post-radiotherapy. The dose distributions calculated by treatment planning and delivered were extracted and compared with SUV distributions obtained from PET imaging. The correlation between dose deposited in the chest wall and clinical complications represented by higher SUV from PET imaging were quantified.
Results: The dose distribution calculated by treatment planning from the different beams overlaid on a CT axial image for a lung patient correlates strongly with SUV obtained from PET imaging. The enhanced SUV represents chronic inflammation of the chest wall tissue that has received high doses by the individual entering beams. The profiles from the regions in the chest wall that have received high dose deposition correspond to enhanced SUV in anatomically matching regions from PET images. Significant proportion of pixels from dose distribution correlates linearly with corresponding pixels that have high SUV-dose in the chest wall.
Conclusions: Large doses deposited in normal tissue from SBRT in treatment of non-small cell lung tumor correlate well with the SUV values measured by PET images. This correlation may be useful in predicting clinical complications by measurement of the delivered dose and SUV values associated with SBRT.