Evaluating Local Failure in Lung Cancer Post-SBRT: The Role of SUVmax

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Purpose/Objective:

Stereotactic Body Radiation Therapy (SBRT) is an effective treatment for early-stage lung cancer but can lead to radiation-induced lung changes that complicates the assessment of the response by CT imaging. Although 18FDG PET is useful for staging, its role to evaluate tumor response or local recurrence after SBRT, remains controversial and there is no consensus on SUVmax values post-SBRT. The aim of this retrospective study is to analyze the SUVmax uptake values in 18FDG PET pre- and post-SBRT and their predictive utility.

Material/Methods:

A review of 18FDG PET studies was performed in patients treated with SBRT-Tomotherapy from 2013 to 2019, with a solitary lung nodule, either histologically proved or high suspicion of lung cancer, size ≤5cm, no lymph node involvement by PET, CT, bronchoscopy +/- EBUS and no previous radiation treatment. Pre and post-SBRT SUVmax values of the nodule were registered. Local failure (LF), overall survival (OS), and their relationship with SUVmax values were calculated. The relative difference in SUVmax in PET scans taken at intervals of 0-3 months, 3-9 months,

and 9-18 months (m) after treatment and the pre-treatment PET was calculated as follows: ΔSUVmax = (PreSUVmax - PostSUVmax) / PreSUVmax. ROC curves and AUC were used to analyze significant values. Kaplan-Meier method and log-rank test or Breslow test were used for survival analysis.

Results:

Ninety-nine patients, median age of 71.4 years, 60% with non small lung cancer adn 40% without proved histology were included. Median follow time was 43 months. Nine LF (one confirmed by biopsy and 8 by radiological/metabolic imaging). Median time to LF was 12 months. A total of 387 PET studies were obtained and grouped into time intervals of months post-SBRT of 0-3 m, 3-9 m, 9-18 m, and >18 m respectively. The median tumor SUVmax was 6.2 (range, 1.10 - 17.97). There was a significant association ($p<0.001$) between LF and SUVmax at 3-9 m and 9-18 m. By the ROC curve analysis, a SUVmax cutoff point of 6.35 at 3-9 m (AUC: 0.930, sensitivity 71.4%, specificity 100%); and 3.85 at 9-18 m (AUC: 0.967, sensitivity 100%, specificity 87%) was observed. The analysis of these cutoff points for the OS showed a significant differences at 3-9 m ($p=0.009$) but not at 9-18 m ($p=0.613$).

Conclusion:

SUVmax of 18 FDG PET might be a promising tool to identify a local failure in patients with solitary lung nodule treated with SBRT. Our study shows to a high sensitivity and specificity of the cutoff SUVmax >6.35 at 3-9 m and >3.85 at 9-18m in association to local failure after treatment.

Keywords: Lung cancer, SBRT, PET/TC

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