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Changes in glucose metabolism during and after radiotherapy in non-small cell lung cancer

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ABSTRACT

Aims and background. Evaluation of the metabolic response to radiotherapy in non-small cell lung cancer patients is commonly performed about three months after the end of radiotherapy. The aim of the present study was to assess with positron emission tomography/computed tomography (PET/CT) and [^{18}F]fluorodeoxyglucose changes in glucose metabolism during and after radiotherapy in non-small cell lung cancer patients.

Methods and study design. In 6 patients, PET/CT scans with [^{18}F]fluorodeoxyglucose were performed before (PET_0), during (PET_1; at a median of 14 days before the end of radiotherapy) and after the end of radiotherapy (PET_2 and PET_3, at a median of 28 and 93 days, respectively). The metabolic response was scored according to visual and semiquantitative criteria.

Results. Standardize maximum uptake at PET_1 (7.9 ± 4.8), PET_2 (5.1 ± 4.1) and PET_3 (2.7 ± 3.1) were all significantly (P <0.05; ANOVA repeated measures) lower than at PET_0 (16.1 ± 10.1). Standardized maximum uptake at PET_1 was significantly higher than at both PET_2 and PET_3. There were no significant differences in SUV_{max} between PET_2 and PET_3. PET_3 identified 4 complete and 2 partial metabolic responses, whereas PET_1 identified 6 partial metabolic responses. Radiotherapy-induced increased [^{18}F]fluorodeoxyglucose uptake could be visually distinguished from tumor uptake based on PET/CT integration and was less frequent at PET_1 (n = 2) than at PET_3 (n = 6).

Conclusions. In non-small cell lung cancer, radiotherapy induces a progressive decrease in glucose metabolism that is greater 3 months after the end of treatment but can be detected during the treatment itself. Glucose avid, radiotherapy-induced inflammation is more evident after the end of radiotherapy than during radiotherapy and does not preclude the interpretation of [^{18}F]fluorodeoxyglucose images, particularly when using PET/CT.

Key words: lung cancer, positron-emission tomography, radiotherapy.

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