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ROLE OF COMPUTED TOMOGRAPHY AND [^{18}F] FLUORODEOXYGLUCOSE POSITRON EMISSION TOMOGRAPHY IMAGE FUSION IN CONFORMAL RADIOTHERAPY OF NON-SMALL CELL LUNG CANCER: A COMPARISON WITH STANDARD TECHNIQUES WITH AND WITHOUT ELECTIVE NODAL IRRADIATION

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Aims and background: **Mediastinal elective node irradiation (ENI) in patients with non-small cell lung cancer candidate to radical radiotherapy is controversial. In this study, the impact of co-registered [^{18}F]fluorodeoxyglucose-positron emission tomography (PET) and standard computed tomography (CT) on definition of target volumes and toxicity parameters was evaluated, by comparison with standard CT-based simulation with and without ENI.**

Methods: **CT-based gross tumor volume (GTV_{CT}) was first contoured by a single observer without knowledge of PET results. Subsequently, the integrated GTV based on PET/CT coregistered images ($GTV_{PET/CT}$) was defined. Each patient was planned according to three different treatment techniques: 1) radiotherapy with ENI using the CT data set alone (ENI plan); 2) radiotherapy without ENI using the CT data set alone (no ENI plan); 3) radiotherapy without ENI using PET/CT fusion data set (PET plan). Rival plans were compared for each patient with respect to dose to the normal tissues (spinal cord, healthy lungs, heart and esophagus).**

Results: **The addition of PET-modified TNM staging in 10/21 enrolled patients (48%); 3/21 were shifted to palliative treatment due to detection of metastatic disease or large tumor not amenable to high-dose radiotherapy. In 7/18 (39%) patients treated with radical radiotherapy, a significant (≥25%) change in volume between GTV_{CT} and $GTV_{PET/CT}$ was observed. For all the organs at risk, ENI plans had dose values significantly greater than no-ENI and PET plans. Comparing no ENI and PET plans, no statistically significant difference was observed, except for maximum point dose to the spinal cord D_{max}, which was significantly lower in PET plans. Notably, even in patients in whom PET/CT planning resulted in an increased GTV, toxicity parameters were fairly acceptable, and always more favorable than with ENI plans.**

Conclusions: **Our study suggests that [^{18}F]-fluorodeoxyglucose-PET should be integrated in no-ENI techniques, as it improves target volume delineation without a major increase in predicted toxicity.**

Key words: elective nodal irradiation, non-small cell lung cancer, PET, radiotherapy.

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