

Multiphase-computed tomography-based target volume definition in conventional fractionated radiotherapy of lung tumors: dosimetric and reliable comparison with the technique using addition of generic margins

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ABSTRACT

Aims and background. The aim of the present study was to compare radiotherapeutic plans based on internal target volume determined by between multiphase computed tomography and addition of a generic margin in lung tumors and to evaluate the reliability of ITV determined by multiphase computed tomography during conventional fractionated radiotherapy.

Methods and study design. The radiotherapeutic plans based on internal target volume determined by between multiphase computed tomography and addition of a generic margin in 10 patients with lung tumors were applied. The difference of two planning target volumes (PTV) and irradiated dose and volume of normal lung tissue were compared. Weekly new targets were delineated on repeated computed tomography scans, and weekly dose coverage of clinical target volume under two different treatment plans was evaluated.

Results. For all patients, PTV_{3CT} volume based on multiphase computed tomography was significantly smaller than that of PTV_{con} based on addition of a generic margin ($t = 6.831$, $P < 0.001$). The volume receiving more than 20 Gy in Plan_{3CT} and Plan_{con} was $16.7 \pm 5.2\%$ and $20.0 \pm 5.2\%$ ($t = 7.565$, $P < 0.001$), the volume receiving more than 5 Gy was $36.6 \pm 7.2\%$ and $42.7 \pm 6.4\%$ ($t = 7.459$, $P < 0.001$), and mean lung dose was 1037.5 ± 275.0 cGy and 1246.8 ± 271.0 cGy ($t = 8.078$, $P < 0.001$), respectively. Both Plan_{3CT} and Plan_{con} provided a satisfactory clinical target volume coverage weekly during conventional fractionated radiotherapy for 6-7 weeks, and the ratio of the volume receiving the prescription dose was 1.03 ± 0.02 and 1.04 ± 0.02 , respectively.

Conclusions. The radiotherapeutic plan based on internal target volume determined by multiphase computed tomography can ensure weekly target coverage during conventional fractionated radiotherapy in lung tumors, and it is better than the plan based on the addition of generic internal target volume, which can effectively reduce normal lung tissue irradiation.

Key words: conventional radiotherapy, internal target volume, lung neoplasm, tumor motion.

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