

Local tumor control probability modeling of primary and secondary lung tumors in stereotactic body radiotherapy

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Abstract

Background and purpose: To evaluate whether local tumor control probability (TCP) in stereotactic body radiotherapy (SBRT) varies between lung metastases of different primary cancer sites and between primary non-small cell lung cancer (NSCLC) and secondary lung tumors.

Materials and methods: A retrospective multi-institutional (n=22) database of 399 patients with stage I NSCLC and 397 patients with 525 lung metastases was analyzed. Irradiation doses were converted to biologically effective doses (BED). Logistic regression was used for local tumor control probability (TCP) modeling and the second-order bias corrected Akaike Information Criterion was used for model comparison.

Results: After median follow-up of 19 months and 16 months (n.s.), local tumor control was observed in 87.7% and 86.7% of the primary and secondary lung tumors (n.s.), respectively. A strong dose-response relationship was observed in the primary NSCLC and metastatic cohort, but dose-response relationships were not significantly different: the TCD90 (dose to achieve 90% TCP; BED of maximum planning target volume dose) estimates were 176 Gy (151-223) and 160 Gy (123-237) (n.s.), respectively. The dose-response relationship was not influenced by the primary cancer site within the metastatic cohort.

Conclusions: Dose-response relationships for local tumor control in SBRT were not different between lung metastases of various primary cancer sites and between primary NSCLC and lung metastases.

Keywords: Lung metastases; non-small cell lung cancer; stereotactic body radiotherapy; tumor control probability.

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