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abstract

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abstract

Evaluation of Target Localization Reproducibility between Deep Inspiration Breath-Hold (DIBH) Sessions in Lung Stereotactic Body Radiotherapy (SBRT)

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Introduction: The integration of Deep Inspiration Breath Hold (DIBH) in lung Stereotactic Body Radiation Therapy (SBRT), coupled with optical imaging modalities, enhances target localization reproducibility, and reduces healthy tissue toxicity. However, variability between DIBH sessions can lead to inconsistencies in target localization, potentially impacting treatment outcomes. The purpose of this study is to evaluate target localization reproducibility between DIBH sessions for lung SBRT patients, considering the combined effect of intra-fractional patient motion and inter-DIBH session target motion.

Methodology: A retrospective analysis of 14 patients treated between 2021 and 2023 was conducted. Intra-fraction DIBH variation was measured using CBCT dataset records, with 111 DIBH pairs analyzed. Dosimetric impacts were calculated by applying couch shifts to original plans' isocenters.

Results: Ten out of 14 patients (71%) had DIBH variation of <5 mm in all directions, with average variations of -0.68 mm ±1.90 mm vertically, -1.26 mm ±3.53 mm longitudinally, and -0.24 mm ±1.43 mm laterally. The remaining four patients exhibited >5 mm target shifts between DIBH sessions. Worst-case scenarios dose computations indicated reductions in GTV receiving 100% of the prescription dose (V100%) ranging from -9.48% to -100%. A simulated delivery study for the patient with the largest DIBH variations shows an average GTV V100% coverage decrease from 99.91% to 70.57% (SD=13%).

Conclusion: Although many patients can achieve DIBH with <5 mm variation, the large DIBH variation observed in this study underscores the need for improved patient screening, DIBH coaching, and practice to ensure a successful DIBH treatment.

Conflict of interests: The authors declare no conflict of interests.

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