学位論文抄録

Optimization of respiratory-gated radiotherapy for lung cancer
（肺癌の呼吸同期照射の最適化）

齋藤　哲雄

熊本大学大学院医学教育部博士課程病態制御学専攻放射線治療学

指導教員
大屋　夏生　教授
熊本大学大学院医学教育部博士課程医学専攻放射線治療学

Abstract of the Thesis

Purpose: To investigate the optimal setting of the gating window and determine the useful factors predicting the benefit of respiratory gating in radiotherapy for lung cancer.

Methods: We created irradiation protocols to treat the patients with lung cancer, and compared the lung dosimetric parameters and the treatment time. Gating around end-expiration was compared with gating around end-inspiration. We investigated the advantages and disadvantages of gated radiotherapy around end-expiration using different widths of gating window. We correlated the possible predictive factors with the estimated lung dose reduction by respiratory gating.

Results: Compared to the protocol simulating amplitude-based gating around end-expiration, the lung dosimetric parameters were reduced significantly around end-inspiration. There was no statistically significant difference in these parameters between gating around end-expiration and end-inspiration when using phase mode. The lung dosimetric parameters are smaller, and larger time is needed for treatment, as the gating window becomes narrower. When the duty cycle was reduced from 30% to 10%, time required for irradiation prolonged markedly. 3D CTV motion, craniocaudal CTV motion, and craniocaudal position of CTV relative to carina were significantly correlated with the estimated lung dose reduction by respiratory gating.

Conclusions: With amplitude-based gating, gating around end-inspiration produced a greater decrease in the lung dose, however, the treatment time was prolonged considerably. At phase-based gating, the dosimetric parameters and treatment times were similar, irrespective of whether gating was around end-expiration or end-inspiration. We recommend a 30% duty cycle when the gating window is set around end-expiration, balancing the estimated lung dose reduction and treatment time. 3D and craniocaudal CTV motion and craniocaudal position of CTV are considered to be useful in predicting the benefit of respiratory-gating.