（様式4）

学 位 論 文 の 内 容 の 要 旨

Dissertation Abstract

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（学位論文のタイトル） Title

Tumor control probability analysis for single fraction carbon ion radiotherapy of early-stage non-small cell lung cancer

初期ステージ非小細胞肺がんに対する１分割照射炭素線治療の腫瘍制御確立の解析

（「論文目録（様式3）」の主論文の部分を記載する。英文の場合は和訳をつける。）
For English paper, Japanese title is necessary.

（学位論文の要旨）2,000字程度、A4判 （approx. 800 Words in English /A4 size）

Purpose: To investigate the suitability of the linear-quadratic (LQ) and universal survival curve (USC) models in describing the 3-year tumor control probability (TCP) data from stage I non-small cell lung cancer (NSCLC) patients treated with carbon ion radiotherapy given at a total dose of 59.4-95.4 Gy[RBE] in 18 fractions, 72 Gy[RBE] in 9 fractions, 52.8-60 Gy[RBE] in 4 fractions and 28-50 Gy[RBE] in a single fraction.

Materials and Methods: A meta-analysis of published clinical data from 394 patients presenting with early stage NSCLC was conducted. TCP modeling based on the LQ and USC models was p erformed by simultaneously fitting the clinical data obtained from the different fractionation sche- du les while considering several spread-out Bragg peak (SOBP) sizes. Radiobiological parameters wer e derived from the fit. Based on the results, a novel SOBP was created for the single fraction regi men that was optimized with respect to the USC model aimed at achieving a 95% local cont- rol.

Results: The USC model gave a better fit to the 3-year local control data. The fit using various SOBP sizes yielded transition doses between 5.6-7.0 Gy. The results also revealed α/β ratios between 7.4-9.1 Gy and 7.4-9.4 Gy for the LQ and USC models, respectively.

Conclusions: The USC model provided a better estimate of the local control rate for the single f raction course. For the schemes with more number of fractions, the local control rate estimates from the LQ and USC models were comparable. A USC-based SOBP design was then created for the single fraction schedule. The updated design resulted in a flatter RBE profile compared to thec onventional SOBP design. It also gave a better clinical dose prediction to optimize the tumor con-tr ol rate.