Applicability of the linear-quadratic formalism for modeling local tumor control probability in high dose per fraction stereotactic body radiotherapy for early stage non-small cell lung cancer.

Abstract:
To compare the linear-quadratic (LQ) and the LQ-L formalism (linear cell survival curve beyond a threshold dose dT) for modeling local tumor control probability (TCP) in stereotactic body radiotherapy (SBRT) for stage I non-small cell lung cancer (NSCLC). This study is based on 395 patients from 13 German and Austrian centers treated with SBRT for stage I NSCLC. The median number of SBRT fractions was 3 (range 1-8) and median single fraction dose was 12.5 Gy (2.9-33 Gy); dose was prescribed to the median 65% PTV encompassing isodose (60-100%). Assuming an α/β-value of 10 Gy, we modeled TCP as a sigmoid-shaped function of the biologically effective dose (BED). Models were compared using maximum likelihood ratio tests as well as Bayes factors (BFs). There was strong evidence for a dose-response relationship in the total patient cohort (BFs>20), which was lacking in single-fraction SBRT (BFs20). Our data suggest accurate modeling of local tumor control in fractionated SBRT for stage I NSCLC with the traditional LQ formalism.