AbstractID: 10165 Title: Patient's variation on Tumor Control Probability for lung cancer treatment

Purpose: Many protocols have been applied on Stereotactic Body Radio Therapy (SBRT) and Stereotactic Radio Surgery (SRS) for lung cancers. This work is to investigate the effect of patient variation on tumor control probabilities (TCP) for SBRT, SRS as well as standard fractionated radio therapy for lung cancer treatment.

Method and Materials: Linear-quadratic (LQ) model was used in our TCP analysis. Three different protocols were investigated with the same parameters for LQ model: 1 fraction with 22 Gy total dose, 4 fractions with 48 Gy total dose and 33 fractions with 6600 Gy total dose. The dose inhomogeneity was assumed with a Gaussian distribution with a deviation of σ_{dose}. The patient's variation of radio-sensitivity for a population was added assuming Gaussian distributions for LQ parameters α and β with σ_{α} and σ_{β}, respectively.

Results: Although dose inhomogeneity's existence requires high total dose to achieve the same TCP, for most clinic cases, the dose increase is very limited and TCP could be evaluated base on single prescribed dose for these plans. Patient's variation σ_{α} has more impact on 33 fractions IMRT treatment, the total dose needs to increase by 15%, 19% and 26% to maintain 95% TCP in SRS, SBRT and IMRT when σ_{α} increases from 0.0 to 0.2. At the same time, Patient's variation σ_{β} has more impact on SRS, the total dose needs to increase by 17%, 12% and 5% to keep 95% TCP in SRS, SBRT and IMRT while patient variation σ_{β} increases from 0.0 to 0.2.

Conclusion: Lung SRS and SBRT provide better tumor control for lung cancer than standard IMRT. However, patient variation should be considered when SRS and SBRT are designed for lung cancer treatment. SRS and SBRT also may lead to more lung complications.