AbstractID: 8658 Title: The Study of Clinical Application of gEUD-Based Optimization in IMRT treatment planning for Lung Cancer Patients

Purpose: The purpose of this work is to reveal if biologically generalized equivalent uniform dose (gEUD)-based optimization in intensity-modulated radiotherapy (IMRT) treatment planning is practical in clinic for lung cancer patients. **Method and Materials:** gEUD-based optimization was investigated in IMRT treatment planning for 15 lung cancer patients using Pinnacle treatment planning system. The optimized results were compared to those obtained under the same conditions except the objective functions in the clinical approved dose-volume (DV)-based optimized IMRT plans in terms of DVH, dose distribution, mean dose, and tumor control probability (TCP)/normal tissue complication probability (NTCP). Statistical analysis was done using a statistical software. **Results:** In average for all 15 lung cancer patients, TCP was increased by 7.09% and NTCP was decreased by 7.00% in the gEUD optimized plans compared to that in the clinical approved plans. Meanwhile, the mean dose of PTV was increased by 3.22%, and the mean doses of total lung, esophagus, heart, and spinal cord were decreased by 7.46%, 5.52%, 5.97%, and 5.05%, respectively. Both gEUD plan and DV plan had similar prescribed dose coverage for PTV. The volume received dose of at least 5 Gy (V5) for total lung was decreased by 4.35%, V10 by 6.57%, V20 by 8.73% and V30 by 10.61%. V40 for the heart was decreased by 9.81%. V55 for the esophagus was decreased by 10.96%. The maximum dose of spinal cord was decreased by 2.82%. The gEUD-based optimization could result in a better dose profile. The improvement was proved to be statistically significant. **Conclusion:** gEUD-based optimization could lead to better tumor cell kill and better critical structure sparing than DV-based optimization, which is the currently used in IMRT treatment planning in clinic. We believe that biologically gEUD optimized radiotherapy should be practical in clinic.