

AbstractID: 13010 Title: A retrospective analysis in head and neck cancer by using the simplified Monte Carlo algorithm

Purpose: We have developed a simplified Monte Carlo calculation (SMC) algorithm of dose distribution in proton therapy to improve the accuracy of dose calculations yet with a reasonable calculation time. We had verified SMC by comparing with measurements. We retrospectively analyzed plans of head and neck cancer patients that occurred side-effect radiation damage using SMC. **Method and Materials:** The SMC uses measured effective source parameters and a measured mono-energetic proton depth dose curves, it is easy to adapt to facilities. Protons are traced their trajectories taking into account the multiple Coulomb scattering using the Highland's formula and range losses using the water-equivalent model in materials. The relative dose deposit in a water voxel or in a patient voxel is obtained from the residual range of an incident proton in water and the water-equivalent thickness of the voxel using a shifted measured Bragg curve in water. We retrospectively analyzed a plan of a treated patient with T4N0M0 adenoid cystic carcinoma. **Results:** SMC estimated higher dose delivery to right optic nerves and optic chiasma than that of the PBA. This means that there is greater risk of vision loss. The PBA underestimated deep-region dose as compared with the SMC, and resulted in the difference of DVHs. **Discussions and Conclusions:** We retrospectively analyzed a plan of a treated head and neck cancer patient that occurred side-effect radiation damage. The PBA underestimated the risk of untoward radiation damage by dose underestimation in deep region supported by phantom studies. The results of the SMC expected a high risk of the side-effect radiation damage. Thus, for clinical analysis, the difference of DVHs between the SMC and the PBA suggests the effectiveness of Monte Carlo dose calculation in treatment planning. We continue widely many retrospective analyses using the SMC.