AbstractID: 9026 Title: Inhomogeneity Correction on the Proton Beam in Radiotherapy Planning using Computed Tomography for Head-And-Neck Tumors

Purpose: The inhomogeneous stopping power in a treatment planning system is determined by the relation of the hounsfield units (HU) of CT images to stopping power. To quantify differences between the dose distributions calculated by the proton treatment planning system and the actual dose distribution, because the inaccuracy of calculations may arise due to inhomogeneity by the presence of surface curvature, air cavities, and bony structures in the head-and-neck region.
Method and Materials: We compared the two planning strategies for head-and-neck patients: (i) original CT; and (ii) corrected CT in which the HU values inside air cavity were replaced by -1000 of air HU value. Proton beam plans for original CT images were performed and then verification plans, using the same proton beam settings as those for the uncorrected CT images, were applied to the corrected CT images. In the plan comparison, the range shift of the proton beam and change of dose distribution between original CT and corrected CT images were revealed.
Results: In some clinical data, DVH of plan using original CT demonstrated was different from the result using corrected CT. Target coverage is unaffected by whether the CT images are corrected or not, the irradiated volume of normal organs such as brain stem, optic chiasm, optic lens in verification plans with corrected CT is higher than that in plans with uncorrected CT.
Conclusions: In proton radiotherapy, the correct prediction of proton beam range in treatment planning is critical for precise delivery of radiation does to the target. It could be important for purpose of range calculation of proton beams in treatment planning that the HU value of air cavity is replaced by optimal HU value making an allowance for CT artifacts for head-and-neck tumors.