AbstractID: 13663 Title: A Feasibility Study of Using Convolution Method of a Motion Kernel to Correct Tumor Motion Effect when Treating Pancreatic Cancer with Intensity Modulated Radiation Therapy (IMRT)

Purpose: To study the feasibility of using convolution method of a motion kernel to correct tumor motion when treating pancreatic cancer with IMRT. **Method and Materials:** Five pancreatic IMRT plans were selected in this study. The Mapcheck device was placed on a moving phantom that simulated the 3D tumor motion: a sinusoid wave with a period of 4s. The IMRT plans were delivered under this condition, and the motion-applied measurements were obtained. A convolution method incorporating the 3D pancreatic tumor motion was applied to correct tumor motion. The motion-corrected verification fluence maps were extracted from the motion-corrected 3D dose, and the simulated Mapcheck measurements were derived. Motion-corrected verification fluence maps were compared with the measured ones, and simulated measurements were compared with the static verification fluence maps. The IMRT QA passing rates for those comparisons were obtained using the most stringent criterion (90% passing rate at 3%/ 3mm DTA, TH=10%). **Results:** The agreement between the measured and motion-corrected verification fluence maps was ideal (the IMRT QA passing rates $\geq$ 98.5%). The magnitude of pancreatic tumor motion >1.0 cm caused a significant dosimetric effect as indicated by the IMRT QA passing rate. The IMRT QA passing rates dropped as low as 61% with the maximum magnitude of motion (2.4 cm). **Conclusion:** The motion correction by using motion kernel convolution is a reliable way to predict the actual dose to the moving target for IMRT plan. The motion convolved dose distribution should be used for accurate dose evaluation as the static dose distribution provided by TPS may provide erroneous dose prediction. A universal margin to compensate for tumor motion should be avoided in the clinical practice, and 4D MRI or 4D CT should be employed to evaluate the extent of pancreatic tumor motion for each patient.