AbstractID: 10585 Title: Dosimetric benefit of a combination of respiratory-gating, image-guidance and intensity modulated radiation therapy for pancreatic cancer treatment

Introduction: In order to account for internal tumor motion and setup uncertainty, 3D-conformal treatment (3D-CRT) for upper gastrointestinal malignancies requires the placement of margins around the clinical target volume (CTV). These larger margins can result in excessive dose to normal tissue. To spare critical structures while elevating the dose to the tumor, we have investigated the dosimetric benefits of combinations of respiratory-gating, image-guidance and intensity modulated radiation therapy (gated-IG-IMRT) for pancreatic cancer treatment.

Materials and Methods: Both 4D-CT and 3D-CT were acquired for each of the cases under study. For respiratorygated treatment, contours for the gross tumor volume (GTV) and critical structures on the end-of-exhale 4D-CT were generated from the original contours on 3D-CT using the MIMvista deformable registration algorithm. A reduced setup margin for image-guided plans was used to create the planning target volume (PTV). IMRT plans were optimized based on dose volume histograms and published normal tissue constraints. Six plans for each patient were created and the PTV coverage and the dose distributions in critical structures were compared.

Results: The six combinations of treatment modalities provide clinically acceptable PTV coverage and normal tissue doses that meet all dose constraints for organs at risk. IMRT and image-guided plans provided equivalent or lower mean doses to normal tissues than 3D-CRT and non-image-guided plans, respectively. Respiratory-gated treatment plans provided slightly lower doses to liver, stomach, right kidney, spinal cord, and spleen, but significantly reduced dose (60-70%) to left kidney when compared with non-gated plans.

Conclusions: By combining technologies and decreasing the margin, dose escalation will be possible in the treatment of pancreatic cancer without compromising the dose to normal tissue.

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