AbstractID: 11839 Title: SPECT-Guided Radiation Therapy Planning for Yttrium-90 Microspheres Therapy

Purpose: ^{90}Y based microspheres are used for unresectable liver metastases by selectively transporting the radioactive spheres to the metastases via hepatic-arteries. This is due to the fact that liver tumors receive most of their blood supply from the hepatic-arteries, while the normal liver receives the blood through the portal-vein. The microspheres prescription is based on the body surface area and several studies attempted dose-calculations using MIRD formalism assuming activity distribution is uniform in tumors and liver. In reality, microsphere distribution is not uniform because the radioactivity selectively administered through the hepatic-artery. In the absence of commercial radiation treatment planning systems for microsphere therapy, it becomes difficult to determine the radiation dose distribution and the dose volume histograms to determine the target coverage and dose-volume tolerance of normal liver. In this work we have outlined a method based on intensity volume histogram (IVH) determined from ^{99m}Tc-macroaggregated albumin (MAA) SPECT scan.

Methods: Both volumetric SPECT/CT scans and contrast-enhanced CT scan were acquired for the patient. Liver is contoured on both the SPECT/CT and the contrast CT. Tumor is contoured only on the contrast CT. Both scans were then registered in CERR (Computational Environment for Radiotherapy Research). Intensity values of SPECT scan are converted to dose distribution based on their relative intensity values and the assumption that the microspheres would have the same intensity distribution as the MAA scan.

Result: DVH is derived from the converted dose distribution and the contoured structures. Administrable activity is adjusted based on the normal liver DVH with an ultimate goal of keeping 800-1000cc of normal liver below 30 Gy. This methodology is also helpful in determining the activity to be delivered incase of retreatment taking into account the previously administered dose to the normal liver.

Conclusion: Using DVH of the normal liver administrable activity can be determined