

Comparison of Two Commercial Software Packages for Y-90 SIRT Dosimetry

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INTRODUCTION

Post treatment imaging for Y-90 selective intra-arterial radiation therapy (SIRT) is becoming more commonplace in the clinic as it provides a quantitative picture of how well the Y-90 microspheres were delivered to the tumor. There are multiple options available commercially to calculate the dose from a post Y-90 Bremsstrahlung SPECT/CT scan. Here, we assessed two different systems to determine if their dose calculation models correlated with each other.

RESULTS

A strong linear correlation was found across all dose metrics assessed as seen in Fig. 1. The maximum dose and D2% showed the strongest correlations at $R^2 = 0.995$ and 0.997 , respectively. The D95% showed the lowest correlation at 0.957 . The mean dose and D50% showed strong correlations as well (0.989 and 0.973 , respectively). All correlation coefficients were >0.955 demonstrating excellent agreement between the two systems.

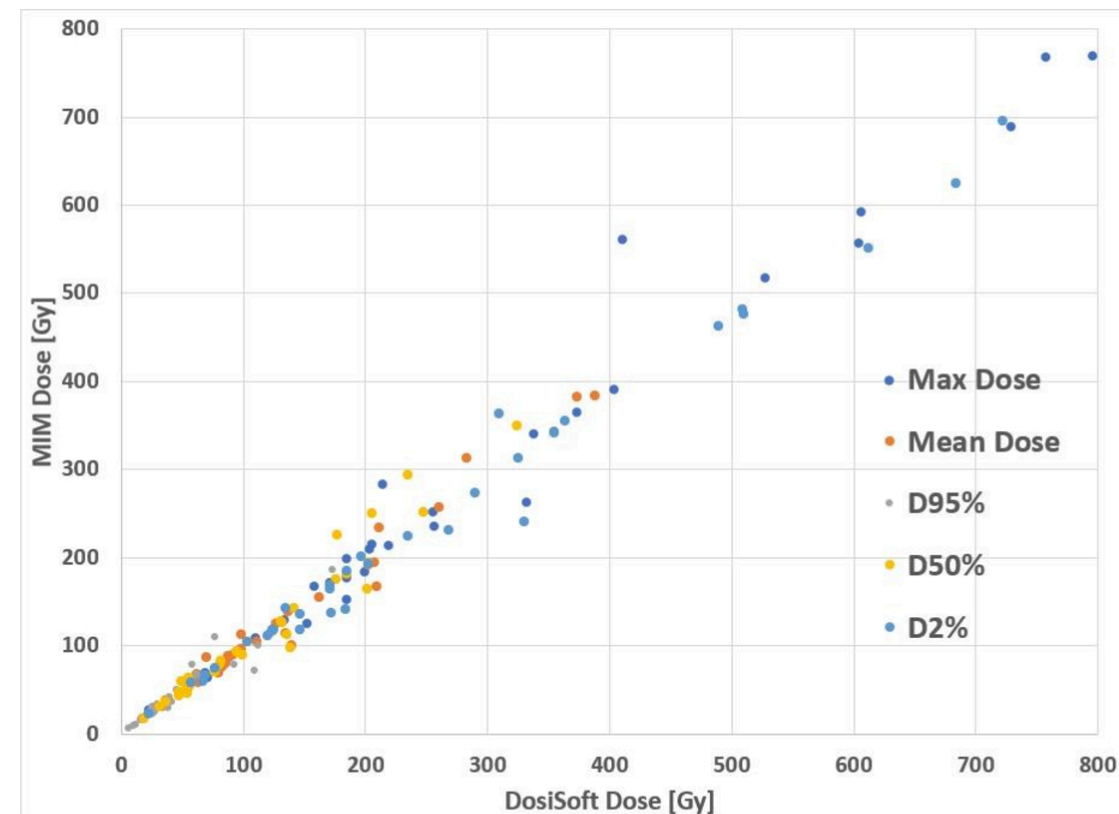


Figure 1. Correlation for various dose metrics between the two planning commercial systems.

METHOD

Retrospective dosimetric analysis of post treatment Bremsstrahlung Y-90 SPECT/CT from 34 patients diagnosed with Hepatocellular Carcinoma (HCC) who received SIRT were compared using two commercially available software packages, MIM SurePlan™ (MIM Software Inc. Beachwood, OH) and DOSIsoft PLANET® (DOSIsoft USA, Miami, FL). For a direct comparison, the structures segmented by the radiation oncologist were used in both systems. The 3D local deposition model (LDM) was used for dose calculation using only the counts contained in the liver to minimize the extraneous counts in the image. Patients received an average dose of 1.9 GBq (0.3-4.9 GBq). To compare the systems over a range of dose levels, we obtained the GTV maximum and mean dose along with the GTV D95%, D50% and D2% from dose volume histograms. The correlation coefficients between the datasets were calculated.

CONCLUSIONS

Two commercially available software packages that perform 3D voxel-based dosimetry on post treatment liver SPECT/CT imaging were compared using studies from a cohort of patients treated with Y-90 SIRT for HCC. Both systems provide quantitative analysis of the delivered dose distribution. There is hope that dosimetric assessments can be proven to be predictive of treatment outcomes and guide clinical decisions indicating when additional treatments should be offered early after Y90 SIRT (e.g. underdose). The results from this comparative study demonstrated a high degree of similarity despite the presence of several confounding factors and limitations involved in the process. It is very encouraging to report that the two software platforms provide similar dosimetric findings and this increases our confidence that such software can be utilized clinically. Further validation is warranted before making treatment decisions based on the post treatment dosimetry.

CONTACT INFORMATION

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