AbstractID: 11582 Title: Methodology to incorporate the BED and EUD in Patient-Specific 3-Dimensional Dosimetry for Non-Hodgkin's Lymphoma Patients Targeted with 131I Tositumomab Therapy

Purpose:
The efficacy of targeted radionuclide therapy depends on the uniformity of radionuclide distribution within the target volume as well as on the radiosensitivity of the tissue. The inclusion of dose non uniformity and biologic effects in the dosimetry of radionuclide may help in correlating dose with patient outcome. Our goal is to develop a methodology incorporating the biologic equivalent dose (BED) and the equivalent uniform dose (EUD) formalism for radionuclide dosimetry.

Materials and Methods:
A 3D imaging–based patient-specific dosimetry methodology was applied to six non-Hodgkin's lymphoma (NHL) patients treated with I-131 labeled tositumomab for model evaluation purposes. Six registered SPECT/CT scans were obtained for each patient and used to generate 3D dose rate distributions using a Monte Carlo code. The dose rate distributions were integrated over time to obtain 3D time-dependent absorbed dose distributions using fitted activity curves. Radial deformation model was used to account for tumor regression during therapy relative to initial volume. 3D time-dependent biological equivalent dose (BED) distributions were calculated and used to estimate a single equivalent uniform dose (EUD) for each tumor volume.

Results:

The methodology developed in this work allows for the adjustment of model parameters such as radiosensitivity, proliferation, unlabeled protein effect, and clearance time based on patient data. Model outputs are being validated against tumor regression. The EUD values for the tumors included in this study show a reduction between 11% -23% in the efficiency of dose delivery and appear to correlate with tumor regression better than total tumor dose.

Conclusions:

The methodology developed in this work allows for the inclusion of various effects that influence the effectiveness of targeted radionuclide therapy of NHL. Model parameters could be adjusted to aid in improving predictions of patient outcome.