Abstract ID: 18186    Title: Radiation Dose During Chemoembolization: A Predictive Model

Purpose: To identify variables correlated with radiation dose during hepatic chemoembolization, quantify their individual impact, and apply these findings to build a dose prediction model.

Methods: A retrospective review of 77 patients undergoing hepatic chemoembolization between 1/2010-10/2010 was performed. Variables included: Radiation dose metrics [DAP, CD, number of cone beam CT and fluoroscopy time] and clinical parameters (BMI, session number, extrahepatic embolization, lesion number, chemoembolization regimen and lobe(s) treated). CD was the primary outcome measurement used for the dose model. Univariate and multivariate linear regression models were used to assess the association between dose metrics and predictive variables and assess the relative impact of each variable on dose. Variables were considered statistically significant at the p<0.05 level. Coefficient of determination (R2) and root mean square error (RMSE) were calculated for CD. R2 was used to evaluate goodness of fit and RMSE was used to establish a measurement of the typical size of the error in predicting the cumulative dose.

Results: Based on the multivariate analysis: higher BMI, regimen, single lesions, 1° tumor and initial session were statistically significant and incorporated into the following dose prediction model: Predicted Dose (mGy) = -672 + BMI (56.3) + 558 (session #1) + 1789 (extrahepatic a. embolized) + 232 (1°tumor) + [-667 (2-4 lesions) or -12 (>5 lesions)] + [370 (dox-bead regimen) or 1618 (ethiodol based regimen)]. Plots of the predicted vs actual CD were performed and the adjusted R2 for CD is 52.9% (RMSE = 697). The model is accurate at predicting 52% of the variation. When the model predicts a dosage of 1000 or 2000 mGy the actual dose interval ranges from 519-2519 mGy or 384-3616 mGy, respectively.

Conclusions: Creating a radiation dose prediction model is feasible. This is the first known attempt at creating a dose model for image guided intervention and refinements to the model will be required to improve its accuracy. Prospective dose modeling will become more relevant as the cost benefit analysis of radiation exposure enters the decision making process in patient care.

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