(all grades) ranged from 6.9% to 79.1%. The dosimetric parameters that were frequently studied (≥4 papers) included: percent of organ volume receiving greater than a threshold dose (Vdose), mean and maximum point dose delivered to the esophagus, and absolute length of esophagus included in the radiation field. Table 1 describes the dosimetric parameters that were studied and the percentage of those papers that demonstrated a significant correlation with grade 2 or greater RE. Heterogeneity of esophageal contouring practices, reported individual reported information, and RE outcome definitions exists in the literature. Few well-developed models including DVH metrics with or without other relevant prognostic factors to predict the risk of significant RE exist in the literature.

Conclusions: We propose that future studies assessing this relationship should focus on a smaller subset of the available parameters (V10, V20, V30, V40, V50 and mean esophageal dose) that have shown consistent correlation between the DVH parameter and RE. A well-developed model would assist in routine radiation therapy planning and design of future clinical trials evaluating novel radiotherapeutic approaches and/or chemotherapeutic agents. Rigorous standardization of dosimetric parameter determination, contouring practices, and RE outcome definition will be critical in rationally improving the therapeutic ratio in this patient population.

Table 1: World literature summary of the correlation of esophageal dosimetric parameters

Dosimetric Parameters	Number of Papers assessing relationship between parameter and RE	Respective Percentages of Statistically Significant Associations
V50	n = 12	75%
Mean dose, V60	n = 9	89%, 44%
V40, V55, max dose	n = 8	75%, 63%, 63%
V45	n = 7	71%
V65	n = 6	33%
V20, V30, esophageal length	n = 5	80%, 80%, 40%
V10	n = 4	75%

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2921 Evaluation of Bone Inhomogeneity Correction by the Analytical Anisotropic Algorithm

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Purpose/Objective(s): A recently commissioned Analytical Anisotropic Algorithm–AAA for photon dose calculation was implemented in the Eclipse (Varian Medical Systems) Treatment Planning System–TPS. In order to evaluate the calculation in inhomogeneous tissue we investigated the dose distribution in a simple geometry containing a bone slab incorporated into a water phantom. The dose prediction, while considering inhomogeneity correction, for this configuration was evaluated in comparison to the reference values suggested by the American Association of Physicists in Medicine–AAPM task group 65 (TG65) and to a preliminary Monte Carlo–MC simulation performed with the Penelope package. The earlier Pencil Beam Convolution–PBC algorithm implemented in the TPS was also included in the comparisons.

Materials/Methods: In this study we investigated the 6MV photon beam from the Varian Clinac 600C. The correction factors for bone inhomogeneity reviewed by TG65, based on experimental measurements, were compared to the ones predicted by the Eclipse algorithms for dose calculation. The calculated Percentage Depth Dose–PDD curves were compared to Monte Carlo simulations with the PENELOPE code. The MC method is known as an adequate tool for radiation beam studies. The same slab phantom from TG65 was virtually created in the TPS and in our MC user code. It is composed by a 3 cm thick bone slab immersed in a water cubic phantom at 3 cm depth perpendicular to the beam axis. A single 10 cm × 10 cm field was assigned to the phantom surface and the depth dose distribution at the central axis was computed by the PBC algorithm using the modified Batho Power Law correction method, the AAA with the inhomogeneity correction method turned on, and by the Monte Carlo simulation. In order to determine the correction factors a second calculation in a homogeneous water phantom was performed in each case. The calculation grid size for both algorithms in the TPS was set into 2.5 mm. For the MC calculation the dose distribution was tallied into voxels of 1 cm × 1 cm × 0.5 cm, the radiation source was described by a previously Monte Carlo generated 6MV photon spectrum of the accelerator with a uniform distribution sample, and the delimiting jaws and the phantom were explicitly described. The MC simulation was performed in a 2.8 GHz PC with Pentium 4® processor, under Windows® operational system.

Results: Average differences between the correction factors for bone inhomogeneity and the reference values of the TG65 evaluated at depths beyond the inhomogeneity (from 6.0 cm to 15 cm depth) and through the central beam axis were (1.2 ± 0.8)% for the AAA and (1.9 ± 1.0)% for the PBC with Modified Batho Power Law correction method. Dose inside the inhomogeneity is overestimated in 5% to 6% by both algorithms. However, the depth dose distributions agree in a 3% level of statistical uncertainty from the preliminary MC calculation.

Conclusions: The average differences of the inhomogeneity correction factors indicate that the TPS algorithms predict the dose deposition beyond the inhomogeneity with a satisfactory level of accuracy, but can overestimate the dose inside the inhomogeneity. The results also indicate that AAA improves the dose calculation accuracy.

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