AbstractID: 14284 Title: Surface base dose comparison for photon radiotherapy

Purpose: To investigate surface base distance as a metric for dose comparison.

Method and Materials: The distance between two dose distributions can be calculated by introducing a dose gradient factor α, which is defined as the multiplicative inverse of the average dose gradient of a dose distribution. 10 IMRT patient plans were studied to determine the average dose gradient factor. Spatial and dose shifts (0-10 mm and 0-10%) were applied to the test cases, the distance distribution between the original plan and shifted plans was then calculated, and the correlation between expected distance and mean distance , 90 and 99 percentiles of distance distribution (D90 and D99) were calculated. The relationship between expected distance and mean distance, D90 and D99 was established with linear regression. The distance between plans and measurements were then calculated for all test cases. The distribution of distance was analyzed and patient statistics were evaluated.

Results and Discussion: The range and mean for dose gradient factors of 10 regular IMRT plans are [0.719, 1.724] and 1.031 mm/%. The correlation between the expected distance and mean distance, D90 and D99 was determined to be 0.906, 0.940 and 0.976 respectively, with linear regression; the coefficients for mean distance, D90 and D99 were determined to be 0.348, 0.680, and 0.821 respectively. This result indicates that although mean, D90 and D99 are good indicators of the true difference between two dose distributions; they all tend to underestimate because of the minimizing term in the definition. The 95% confidence interval (CI) of D90 was [2.43, 3.73] mm for 10 IMRT cases.

Conclusion: Surface based distance can be used as a metric to quantify the difference between two dose distributions. Patient statistics studies can be performed with this technique.