AbstractID: 12867 Title: Small Field Dosimetry for Stereotactic Body Radiotherapy (SBRT)

Purpose: The dosimetry of small radiation field ($\leq$3x3 cm^2) poses a number of challenges that includes the nonequilibrium condition and the high dose gradients in a very small region, especially for small field SBRT where high doses are delivered in small number of fractions. The purpose of this work is to assess the dosimetry of small fields, dose accuracy and then verifying SBRT plans using Gafchromic film measurement and Monte Carlo calculations.

Materials and Methods: Eclipse planning system was configured with measured data as small as 1x1 cm^2 field size. Some small field profiles from planning system at different depths were compared with Gafchromic film measurements and Monte Carlo simulations. Different small field point doses were calculated and compared with measured results and Monte Carlo calculations. Several SBRT small field plans were verified by using films and Monte Carlo simulations based on isocenter dose, target dose coverage, dose volume histogram and critical structure dose distributions.

Results: The film measured profiles and point dose for small fields were in good agreement with Eclipse planning system and Monte Carlo simulations within 2mm or 2%. Four small field SBRT plans on lung, brain and liver cancer were selected for evaluation. The target dose coverage and dose distributions from plan, film measurement and Monte Carlo were matched with each other. The isocenter dose difference between Eclipse and Monte Carlo calculation was less than 2%. The dose differences between Eclipse and film measurement were within 4% for all the plans. There was no significant different on critical structures dose distribution for planning system, measurement and Monte Carlo simulations.

Conclusion: The application of evaluation techniques as applied in Gamma Knife such as Gafchomic film and Monte Carlo calculations to the dosimetry of very small fields gives better dose accuracies, then sufficient accuracy for small field SBRT.