AbstractID: 8935 Title: Dosimetric Evaluation of a Delivery Verification and Dose Reconstruction for Helical Tomotherapy

Purpose: To determine the dosimetric accuracy of a dose reconstruction method used for verification of helical tomotherapy delivery for four different clinical sites.

Method and Materials: A delivery verification and dose reconstruction method has been applied to helical tomotherapy treatment plans of four different treatment sites (prostate, head and neck, lung and total scalp). Treatment plans were generated on a cylindrical measurement phantom (TomoPhantom) using contours, prescriptions and planning objectives taken from clinical patient plans from the four sites. Several film and ion chamber measurements were made for each plan to simulate the dose variation with multiple deliveries. Additional measurements mere made with intentional changes made to the machine output and leaf open times.

A TomoTherapy delivery verification tool uses pulse-by-pulse machine CT detector and transmission ion chamber data, extracted at the conclusion of each delivery, to determine the incident energy fluence delivered for each projection. Dose reconstruction with the delivered energy fluence was calculated on the planning CT and compared with both the measured dose distributions and those calculated from the original treatment plan. Differences were compared using dose difference plots.

Results: Measured (ion chamber) dose variations in the center of the PTV for repeated daily deliveries of a given treatment plan were small, typically within 2%. Greatest differences in the measured doses occurred with intentional changes in leaf open times. The measured dose variations were well predicted by the dose reconstruction method, which demonstrated agreement with the measured dose within 2%. The dose reconstruction method also demonstrated acceptable agreement with the film dose measurements, for each of the clinical plans.

Conclusion: Variations in treatment delivery due to machine output or leaf opening time changes can be determined using the investigated method.

Conflict of Interest: Supported in part by a research agreement with TomoTherapy, Inc**.**