AbstractID: 7449 Title: Clincal Evaluation of an Independent Dose Check Algorithm for Helical TomoTherapy

Purpose: To determine the clinical acceptability of an algorithm developed to independently verify doses calculated by the TomoTherapy treatment planning system.

Method and Materials: Point doses from treatment plans for 97 patients treated on a TomoTherapy system were compared to an independent dose calculation algorithm developed at our facility. All patient plans for which treatment sinograms were available were included in the comparison, which represented a variety of treatment sites and plan parameters. For each treatment plan, the calculation point was selected to be in the geometric center of the primary PTV, where beam modulation and high dose-gradients were expected to be minimal. If this process put the point into a high dose-gradient region or very near a tissue interface region, the point was manually repositioned.

Results: Comparisons of our calculation to the TomoTherapy-predicted point doses for the patient treatment plans showed good agreement. For sites other than lung and superficial PTVs, agreement between the calculations was within 2% for 94% of the patient calculations (64 of 68). Our independent calculations within the lung or superficial PTVs overestimated the dose by an average of 3.1% (σ =2.4%) and 3.2% (σ=2.2%), respectively.

Conclusion: Systematic errors at points within lung are probably the result of the known weakness of the radiological path length method for correcting for missing tissue and/or tissue density heterogeneities. Errors encountered at points within superficial PTVs are probably the result of our algorithm overestimating the scatter dose at points near the surface of the patient. For the majority of cases, the algorithm demonstrates sufficient accuracy for clinical use and may be used to independently verify patient treatment plans.