AbstractID: 14032 Title: Accuracy of TomoTherapy Calculated Dose Distributions: Correlation with Field Width and Gantry Rotation Period

Purpose: Data from 512 patient delivery quality assurance (DQA) measurements from two TomoTherapy units were analyzed to evaluate accuracy of dose calculations by the TomoTherapy treatment planning system with variation in modulation factor, gantry rotation period and field width. **Method and Materials:** Two DQA measurements were made for each patient in a cylindrical phantom using Exradin A1SL ion chambers and compared to doses calculated at these points using the TomoTherapy planning system. The arithmetic mean of the two ratios of measured to calculated dose were termed the "quality ratio" and used to assess dose calculation accuracy. Ninety-five percent confidence intervals for the population means of subsets of each parameter's range of possible values were calculated and compared. Since the quality ratio was found to vary with field size, each parameter was analyzed for each field size separately. This was done for the data from the two treatment units separately, as well as for the combined data. **Results:** The combined data from both units show 95% confidence intervals for the 1cm, 2.5cm, and 5cm field sizes to be 1.008-1.018, 0.999-1.002 and 0.982-0.993. The 95% confidence intervals for 15-19 second and 20-60 second gantry rotation period subsets are 1.00-1.01 (25 patients) and 1.01-1.02 (37 patients) for the 1cm field size and 0.996-1.00 (279 patients) and 1.00-1.01 (129 patients) for the 2.5cm field size, respectively. Modulation factor showed no statistical correlation with quality ratio. **Conclusions:** The data show that the ability of the TomoTherapy treatment planning system to accurately predict the dose measured in the phantom varies with field width and gantry rotation period. Thus accuracy may differ for particular types of treatments that have common field width and gantry rotation period characteristics. Evaluating all DQA data together may mask statistically significant deviations in calculated versus measured dose related to certain plan-specific parameters.