AbstractID: 3143 Title: The impact of calculation grid size on the accuracy of IMRT dose distribution

Purpose: To experimentally investigate the accuracy of complex IMRT dose distribution with varying dose grid size.

Materials and Methods: A Head and Neck compression film phantom was constructed from two semi-hemisphere solid water slabs. Two hypothetical Head and Neck IMRT treatment plans for a 54Gy prescribed dose to a shallow and a deep targets were generated using Philips Pinnacle^3 TPS with 1.5, 2, 3, and 4 mm dose computation grid sizes. Radiochromic films were used for dosimetry. The plans were evaluated by computing the dose cumulative histograms. The 1.5 mm grid size plan was used as a benchmark for plan evaluation.

Results: Dose differences between 2 mm and 1.5 mm grid size calculations were within 120 cGy (2.2% of prescribed dose) for shallow target and 132 cGy (2.4%) for deep target respectively over 95% of the area of analysis. The dose differences were 273 cGy (5.1%) and 253 cGy (4.7%) for the 4 mm grid size. In gamma function tests, all grid sizes met the criteria of acceptability (i.e., 95% of the region resulted in gamma index less or equal to 1 with a 3% dose difference and a 3 mm DTA criteria) except for deep target and 3 and 4 mm grid sizes. It was observed that larger grid spacing produces higher dose gradient, which contributes to the failure of the gamma test. The analyses of surface dose histograms showed a general trend of larger grid size producing broader histogram for surface dose. All grid spacing overestimate surface dose.

Conclusion: Overall, the effect of varying grid size on dose variation appears to be insignificant as long as the grid size is less than 4 mm. However, 2 mm is recommended to ensure acceptable dose calculations, especially in high gradient regions.