AbstractID: 7546 Title: Study of surface dose distribution in sinus cancer

Purpose: To investigate any discrepancies between dose calculations from the Pinnacle treatment planning system and film measurements at the tissue-air interface of an air cavity.

Method and Materials: A ring shaped phantom with removable insert was made to simulate an air cavity within a patient. 6 MV 3D-CRT and IMRT treatment plans were generated for both the cavity (without the insert) and homogeneous situations (with insert) using the Pinnacle treatment planning system (Pinnacle-3^{TM} 8.1r, Philips Medical System, Milpitas, CA). For the air cavity mode, the CTV was around the anterior part of the cavity. The same contour was used for the homogeneous mode. Treatment plans were delivered and Gafchromic EBT^{TM} film was used to measure the dose at the air cavity surface. Films were scanned with an Epson reflective scanner. The blue channel reading was extracted for calibration and measurement. The measured and the calculated doses were compared.

Results: In the homogeneous situation, the measured dose is consistently 4% low perhaps indicating under-response of the film. However, in the air cavity situation, the calculated dose is much higher than the measured value. The average differences in the 3D-CRT and IMRT plans are 18% and 14% respectively. The absolute difference in the 3D-CRT case is larger than for IMRT. This is likely due to the fact that the multiple fields used in the IMRT plans provide secondary electrons generating from different angles to compensate for the electronic disequilibrium.

Conclusion: The Pinnacle system has difficulty calculating the dose at the tissue-air interface. However, the use of multiple, distributed fields, combined with optimization techniques used in IMRT can help to offset the effects of electronic disequilibrium incurred in the air cavity.