AbstractID: 13195 Title: Skin Toxicity in Stereotactic Body Radiation Therapy – Improving the Treatment Planning and Delivery Process

Purpose:
Stereotactic body radiation therapy is delivered using high doses, specialized immobilization and careful treatment planning. Although more centers now offer SBRT treatments, little data regarding toxicity and doses are available. We have previously reported increased skin toxicity with hypofractionated SBRT and correlated toxicity to tumor-skin proximity, beam arrangement and buildup dose calculation inaccuracies. The purpose of this study was to determine the accuracy of our buildup region doses through correlation with in-vivo measurements.

Method and Materials:
Surface doses were measured on 30 patients receiving single fraction 18-24 Gy SBRT. Patients were supine and immobilized with an Alpha Cradle and custom SBRT cradle. IMRT planning with approximately seven posterior, 6 or 15 MV x-rays beams was done using an in-house planning system (TPS) and delivered on Varian accelerators. Buildup region doses were measured with thermoluminescent (TLD) or optically stimulated luminescent (OSLD) dosimeters. An 5–10 dosimeter array was positioned on the patient's surface during treatment. Dosimeter positioning was verified by KV imaging. Calculations at corresponding points at depths 1and 2 mm were done using both our TPS (pencil beam algorithm) and Monte Carlo and compared to measurements. For six patients the TPS calculations were also done including the immobilization equipment.

Results:
In vivo dosimetry showed patient surface dose could be 50% higher than that calculated by the TPS. Factors contributing to higher measured doses were: tumor proximity to surface, immobilization device thickness, beam angular segmentation, and beam energy. Calculations including the immobilization device greatly improved correlation with measurements.

Conclusion:
To limit skin toxicity, SBRT treatments require awareness of beam placement, energy selection and immobilization devices. At these high single fraction doses it is necessary to carefully consider immobilization devices as well as to reanalyze and improve treatment planning beam data in the buildup region.