AbstractID: 14084 Title: Need for robust treatment planning and review tools

Purpose: This paper demonstrates the need for tools to review plan robustness (PR) of the IMRT treatment plans (TP); a special case of head and neck IMRT is presented.

Methods and Materials: Patient with squamous cell carcinoma of the base of tongue was simulated on a slant board and an IMRT plan was generated to deliver 70Gy in 2Gy fractions using Pinnacle treatment planning system (TPS). Due to lack of clearance, posterior beams were avoided and planned with anterior and lateral beams. TP was reviewed and approved by an IMRT physicist and the attending physician. During QA plan generation on a box phantom, unacceptable hotspots were noted on the lateral aspect. This is because the lateral-beams were not opened to cover the posterior-aspect of the target-volume due to field-size limitation. Therefore, optimizer heavily weighted the anterior beams to cover posterior-aspect of the target-volume.

Results: This plan was fixed by opening the lateral beams to cover the posterior-aspect of the target-volume. If it was treated in the presence of systematic lateral setup error, this clinically approved TP could have lead to serious skin inflammation. Plan review couldn't catch this error because most TPS doesn't compute dose outside skin. For those who use just planar dosimetry measurements for IMRT QA would have missed this error. This demands the need for review-tools that can check the TP robustness in the presence of setup errors. We checked the robustness of our plan by shifting the isocenter to simulate setup-errors and computing the dose and comparing the DVH indices. We propose using PR check for all clinical patients and this can be easily implemented using pearl scripts in Pinnacle TPS.

Conclusions: As the radiation delivery techniques get complex, PR check should be part of the plan review process to avoid serious treatment errors.