

AbstractID: 13344 Title: Toward adaptive volumetric modulated arc therapy (AVMAT) for head and neck (H&N) cancer: dose reconstruction using on-treatment CBCT and dynamic log-files

Purpose: To develop a clinically practical procedure for reconstructing the actual dose delivered in the VMAT treatment for H&N cancer

Method and Materials: The proposed dose reconstruction procedure includes four steps: (i) CBCT is acquired before the fractional dose delivery and up-to-date patient model is built accordingly; (ii) systematic log-files are retrieved after the delivery and actual delivery parameters including MLC leaf positions, gantry angles and cumulative monitor units (MUs) are extracted for each control point; (iii) the control point parameters in the original DICOM-radiotherapy plan (RP) file are replaced by the extracted; (iv) the reconstituted DICOM-RP file is imported into Eclipse treatment planning system (TPS) and dose is computed on the on-treatment CBCT-based patient model. A Catphan-600 phantom and five H&N patients were used to show the feasibility and efficacy of the proposed dose reconstruction procedure in clinical practice. For each patient, this procedure was weekly repeated over the course of VMAT treatment to reveal the dosimetric impact of inter-fractional changes in patient model.

Results: A clinically practical dose reconstruction procedure has been established for VMAT treatment. The studies indicate that CBCT-based VMAT dose reconstruction is readily achievable and provides a valuable tool for monitoring the dose actually delivered to the tumor target as well as the sensitive structures. The dose distributions of the reconstituted plan on CBCT are in good agreement with the pCT-based original plan when the patient has no significant changes in the anatomy over the course of treatment. The difference in target DVH between the two plans is clinically insignificant ($< 3\%$). However, larger dose discrepancies ($> 4\%$) are observed when the patient anatomy changes substantially.

Conclusion: The proposed procedure affords an objective means for dosimetric evaluation of H&N VMAT treatment and is useful for adaptive VMAT in future