

Practical Considerations and Clinical Implementation of Patient Specific QA for Volumetric Modulated Arc Therapy

Objectives: We developed the first no-commercial treatment planning system for volumetric modulated radiation therapy (VMAT) in the United States. Because VMAT involves multi-parameter modulations, it is imperative to develop a comprehensive, rigorous and yet, practical procedure for routine patient-specific QA. Here, we present our own approach as currently practiced at our institution.

Materials and Methods: Our patient-specific QA procedure involves multi-levels: pre-treatment QA, on-treatment QA, and post-treatment QA. The pre-treatment QA focuses on dosimetry verification. It is done with the commercial MapCHECK in MapPHAN, mounted on an isocentric mounting fixture (IMF). This approach is also called the fixed-gantry technique, i.e., the beams are always perpendicular to the detector plane. The on-treatment QA involves *in-vivo* optically stimulated luminescent dosimetry (OSLD). Prior to the treatment, two *nanoDot*TM OSLD dosimeters are placed on the patient abdomen under 1 cm bolus at the isocenter location. The irradiated dosimeters are read by a *nanoDot*TM reader and the average reading of the two is calculated. The post-treatment QA involves analyzing the DynaLog and DLog files. The DynaLog is a treatment log file that contains the planned and actual leaf positions for a given gantry angle. The DLog file is a treatment log file that contains the planned segmented treatment table (STT) and the corresponding segment boundary samples, i.e., the actual delivered MU and gantry angle increment for each control point.

Results: For the VMAT plans we have treated so far, the average pass rate was $97.3 \pm 2.0\%$ and the dose discrepancy at the isocenter was $-0.77 \pm 0.96\%$. The difference between the calculated and measured doses at the chosen point on patient skin was $-3.1 \pm 0.24\%$.

Conclusions: We believe that our QA procedure can minimize the possibility of treatment errors and maximize the patient safety.