

AbstractID: 8225 Title: Clinical implementation of an integrated system for image-guided radiation therapy (IGRT) and adaptive radiation therapy (ART)

**Purpose:**

It is critical that image-guided radiation therapy (IGRT) and adaptive radiation therapy (ART) are performed with clearly defined goals without abusing the technologies. This study illustrates the current integrated system that provides efficient implementation of IGRT and ART.

**Material & Method**

The process of IGRT starts with planning CT, where the target volumes and critical organs are delineated in the treatment planning system (TPS). A treatment plan is designed and proper QA is performed. For daily treatment, a patient is setup based on skin markers, followed by 2D imaging guidance with radiographs and DRR. Positioning correction is achieved by automatically shifting the treatment couch. Couch positions before and after shift are recorded with the images in the integrated system. Based on the results of daily 2D imaging guidance over the first week, the patient-specific IGRT protocol is determined between daily and bi-weekly/weekly IGRT. The process of ART is performed to adapt patient specific variations using 3D CBCT imaging guidance. If a significant geometrical variation (e.g. deformation, rotation, tumor shrinkage/enlargement) is observed, a verification plan based on CBCT is generated in TPS. We evaluate the dosimetrical consequences of the geometrical variation that cannot be corrected on-line by couch shift. Following the evaluation, a decision is made among choices of a new immobilization device, redesign of the PTV-margin or OAR-margin, re-planning based on CBCT or new planning CT, and IGRT frequencies.

**Results**

The integration of IGRT and ART is achieved by the ARIA (Varian Medical Systems, Inc), which has one server connected to CT/MR/PET units, TPS, record-and-verifying system, treatment consoles, and offline review for IGRT evaluation. IGRT takes 2-5 min and ART takes 1-2 days.

**Conclusion**

Efficient and effective evaluation and decision-making process for IGRT and ART are possible with the integrated system in a timely manner.