

Purpose/Objectives: To present clinical implementation and a method of quality assurance for a new HDR applicator of Strut-Adjusted Volume Implant (SAVI) for partial breast irradiation.

Materials/Methods: The SAVI applicator has multi-peripheral struts that can be differentially loaded with the HDR source in order to achieve a conformal dose distribution to the lumpectomy cavity. The treatment plan is evaluated by a dose volume histogram (DVH) as follows: $V_{90} > 90\%$ or $V_{95} > 95\%$, $V_{150} < 50$ cc, and $V_{200} < 20$ cc. Patients undergo a CAT scan guided simulation using an alpha cradle immobilization for reproducibility. The SAVI device status is verified using both 3D CT images and image fusion in addition to AP and lateral scout films. A self-developed Java program based on the AAPM TG-43 is used for the dose verification and uncertainty analysis.

Results: Fifteen patients to date at Mercy Medical Center, Baltimore, Maryland were treated with SAVI device. The dosimetric data demonstrate the achievements of greater than 90% (95%) coverage for V_{90} (V_{95}) at an average value of 97.9% (96.3%) while keeping a low V_{150} at 34.9 cc and V_{200} at 16.5 cc. Potential uncertainty induced by the SAVI applicator motion is evaluated to be a 3% variation in dose either by a 3-mm translation along the SAVI long axis or 3° rotation from the SAVI applicator.

Conclusion: The feature of multiple catheters of the SAVI applicator allows for optimal and conformal dose distribution around a lumpectomy cavity while minimizing the dose to adjacent normal structures such as skin and ribcage. Reproducible patient setup is important for assessing inter-fraction motion of the SAVI applicator. Multiple methods of AP and lateral scout films, 3D images, and CT image fusion are able to provide valuable information such as cavity variation, strut collapse or relative motion, and device shift.