

## AbstractID: 11335 Title: Quantification of CT Artifact Reduction of Second Generation Intracavitary Brachytherapy Applicator

**Purpose:** A second generation CT-friendly applicator with movable shields has been developed for cervical carcinoma intracavitary brachytherapy (ICBT). We report on a method to quantify the reduction in CT artifact in a phantom study using this applicator.

**Methods and Material:** A gynecological phantom was fabricated to mimic a realistic patient anatomy and to fit a standard intrauterine tandem (45 degrees) and 20-mm diameter colpostats. Once the applicator is inserted, packing using gauze was inserted around the colpostats to reduce air cavity. The phantom with the applicator set was scanned using a CT simulator (AcQSimCT, Philips) using axial mode (2.5 mm slice, 120 kVp, 110mAs). To eliminate image artifacts, two non-overlapping, 30° gantry tilt axial CT scanning series which met at the middle of the ovoid were used. Shields were moved before each series scan to the opposite side of the ovoid. A second CT scan without moving the shields was performed to compare artifacts. The image sets were then rigidly aligned globally using mutual information. A region of interest inside the phantom from the slice with greatest CT artifacts visually was picked for quantitative analysis. The CT number from each voxel was tallied and summary statistics were calculated. Because the images are aligned, we could determine the difference in CT numbers between corresponding voxels from both images.

**Results:** Visually, the CT scan set with shields moved out of the way were almost completely free of artifacts. The average %diff between all the voxels was  $0.6\% \pm 42\%$  ( $2\sigma$ ), with maximum %diff of 1,039% for voxels with the largest artifact.

**Conclusions:** The new applicator provides artifact-free CT imaging without compromising the shields. We found the CT protocol with tilted gantry is easy to perform using CT simulators available in the radiation oncology department.