

AbstractID: 13108 Title: Grid-Based Boltzmann Solver (GBBS) vs TG-43 for Ir-192 HDR Intracavitary Brachytherapy: A retrospective dosimetric study

**Purpose:** To determine dosimetric differences between a grid-based Boltzmann solver (GBBS) and TG-43 for a cohort of HDR cervical cancer cases treated using the CT/MR Fletcher-Suit-Delclos (FSD) type applicator.

**Method and Materials:** Dose distributions from a cohort (n=10) of cervical cancer patients treated with the VS2000 <sup>192</sup>Ir HDR source were analyzed retrospectively using the BrachyVision-Acurus v8.8 TPS. A single physician contoured the rectum and bladder. 6 Gy was prescribed to point A. Doses were recorded for ICRU rectal and bladder points as well as vaginal surfaces. Rectum, bladder, and entire dose grid DVHs were visually assessed and compared at relevant points. Dose grids were exported to IDL to calculate mean voxel percent differences. Average, minimum, and maximum percent dose differences are reported for 1)  $D_{2cc}$  and  $D_{90}$  for rectum and bladder and for 2) dose grid mean voxel percent difference.

**Results:** Visual inspection of DVH showed lateral shifting of GBBS curves to lower doses. The shifting was noticeable for dose levels within 4 Gy. Percent difference results from the DVH output:  $D_{2cc-Rectum}$ : -2.1% (mean) [-3.0% (min), -0.5% (max)];  $D_{90-Rectum}$ : -2.3% [-7.5%, 4.6%];  $D_{2cc-Bladder}$ : -0.7% [-1.8%, 0.7%];  $D_{90-Bladder}$ : -4.4% [-7.0%, -2.2%]. All ICRU points studied had dose differences within -3.3% relative to TG-43. The average of the mean voxel percent difference for the entire dose grid was -1.3% and ranged from -3.7% to 1.2%. Visualization of individual percent difference maps overlaid on CT revealed lower GBBS doses behind contrast filled balloon in the bladder.

**Conclusions:** For this cohort of patients that underwent intracavitary HDR brachytherapy with the CT/MR FSD applicator, the GBBS calculated dose to clinical reference points and hot spots ( $D_{2cc}$ ) was within 3.3% of TG-43. Over the entire dose grid, however, lateral shifting of DVHs to lower doses was observed. This may be partially due to contrast filled balloon in bladder.