

AbstractID: 11585 Title: Effects of shielded ovoids in HDR <sup>192</sup>Ir cervical brachytherapy: A Monte Carlo study using cone-beam CT images

**Purpose:** To investigate the effects of the Fletcher-Williamson applicator set on the bladder and rectal dose for high-dose-rate (HDR) <sup>192</sup>Ir treatment of cervical cancer.

**Method and Materials:** Twenty HDR cervical treatment plans were calculated using an applicator-based dose superposition method. Pre-calculated Monte Carlo dose data were used to account for the effects of the tandem and ovoids. A library of 3D dose distributions around all possible dwell positions in water were generated using the PTRAN code. Both the plastic ovoids and the ones with bladder and rectal shields made of tungsten alloy were modeled. The patient calculations were based upon the treatment plans previously created using cone-beam computed tomography images.

**Results:** The stainless steel tandem together with either shielded or unshielded ovoids reduced the dose to Points A and B by 2.5% and 2.2%, respectively. The dose to the hottest 0.1 cm<sup>3</sup> and 2 cm<sup>3</sup> of the bladder and rectum was reduced by 3.5%–4.5% with plastic ovoids. When shielded ovoids were used, the maximum dose reduction to the hottest 0.1 cm<sup>3</sup> of the bladder was 19.5%, while the ICRU bladder point was reduced by up to 24.5%. However, the dose to the bladder point was reduced by over 10% in only 3 out of the 20 plans. The bladder point dose was decreased by 6.6% on average. On the other hand, there was a 1% additional decrease in the rectal dose compared to the unshielded case. The ICRU rectal point did not correspond to the part of the rectum receiving the highest dose.

**Conclusion:** The ovoid shields in the Fletcher-Williamson applicator set were found ineffective in shielding the high-dose region in the rectum. The orientations of the ovoids also strongly influenced the dose to the bladder.

**Conflict of Interest (only if applicable):** Research sponsored by Nucletron.