

AbstractID: 13064 Title: Dose reduction study in vaginal balloon packing filled with radio-contrast for HDR brachytherapy treatment

**Purpose:** Vaginal balloon packing (VBP) is being explored as new means to displace organs at risk during HDR brachytherapy uterine cervix treatments. The hypothesis is that when filled with radio-contrast agent, VBP can further reduce dose to bladder and rectum.

**Method and Materials:** VBP balloons, semi-sphere in shape, were filled with air, saline, and radio-contrast agents respectively. An Iridium-192 HDR source was placed on the anterior surface of the balloon and the diode detector was placed on the posterior surface. Dose ratios were taken with each material in the balloon. Monte Carlo (MC) simulations were performed to further investigate a wider range of contrast materials and balloon sizes. The MC program DOSXYZnrc was used for the dose calculations. The cross section data of the radio-contrasts were generated using PEGS in EGSnrc based on the chemical compositions.

**Results:** Phantom reading ratios with a balloon radius of 3.4 cm were  $0.922 \pm 0.002$  (Optiray320/saline) and  $0.808 \pm 0.001$  (Optiray320/air). The ratios by MC calculations were  $0.895 \pm 0.010$  (Optiray320/water),  $0.781 \pm 0.010$  (Optiray320/air). Monte Carlo study showed the dose reduction of Optiray350-filled balloon ranges from 6% to 15% compared to water-filled balloon and 11% to 26% compared to air-filled balloon, with a balloon size range of 1.4-3.8 cm. Other commercial gadolinium-based radio-contrast agents showed less dose reduction due to much lower concentration in their solutions. Other Optiray products of lower iodine concentrations also demonstrated less dose reduction. The thickness of the balloon needs to be 1 mm to absorb the excess electrons exiting the radio-contrast solution.

**Conclusion:** The dose to the posterior wall of the bladder and the anterior wall of the rectum can be further reduced if the VBP is filled with radio-contrast agent compared with that of filled with saline or air.

**Conflict of Interest (only if applicable):**