

AbstractID: 10712 Title: A Monte Carlo study for evaluation of tissue heterogeneity effect of inversely optimized intracavitary high dose rate brachytherapy plan

Purpose: To investigate tissue heterogeneity effect of an intracavitary high dose rate brachytherapy plan which is optimized by the inverse planning option. **Method and Materials:** A CT and VOI based brachytherapy plan for an intra-uterine and cervix cancer treatment was made using inverse planning simulated-annealing (IPSA) module provided by Plato TPS. The microSelectron-HDR Ir-192 afterloader and 3 catheters (2 ovoids and 1 tandem) were used for the treatment. For a verification of the plan result, EGSnrc based dosxyznrc Monte Carlo code was employed. Patient CT data was converted to eggsphant data by the ctcreate code and each source position and weight from the plan data was used for a Monte Carlo simulation as well. Ir-192 source was approximately modeled by 3.6 mm length and 0.6 mm diameter and it was assumed to be located at the center of the catheters, while parallel to the z-axis at each position because of restricted freedom of source modeling. The microSelectron-HDR Ir-192 spectrum data could be obtained from the EGSnrc code, however, number of history was determined empirically based on known air-kerma and dose rate value. Conventional point A and B doses and DVHs of PTV, bladder and rectum were evaluated for a quantitative comparison. **Results:** Significant decrease of dose at point A and B more than 10% was observed in the Monte Carlo simulation. PTV coverage by 100% isodose surface was degraded while rectum and bladder mean dose was reduced up to 15%. Resultant dose rate decrease was also observed. **Conclusion:** Conventional brachytherapy dose calculation method could not appropriately consider tissue heterogeneity effect and inverse planning optimization could invoke serious erroneous result. Therefore inverse planning optimization should be carefully implemented for a HDR brachytherapy planning.