

AbstractID: 3049 Title: Dose conformity improvement using lead-shielded intracavitary mould applicator for patients with rectal carcinoma

**Purpose:** We present dose distribution results of Monte Carlo (MC) based treatment planning, employing Intracavitary Mould Applicator, used in pre-operative high dose rate brachytherapy treatment of patients with rectal carcinoma, with the central lumen filled with lead as a shielding material. To justify the application of this shielding technique, the MC dose kernel calculations have been compared with experimental measurements.

**Method and Materials:** Eight catheter channels are equally distributed over the circumference of the applicator with a central lumen intended to be used for insertion of an additional extending central catheter. Two dose kernels have been calculated for  $^{192}\text{Ir}$  source using the DOSXYZnrc Monte Carlo code: one for water phantom that includes air in the central lumen and another one for water phantom that includes lead shielding in the central portion of the applicator. For the dose measurements, we have used an Exradin planar ionization chamber (Model A14P). For the sake of MC dose kernel experimental verification, we have simulated the experimental phantom with scoring regions corresponding to the measurement points to increase the number of simulated photons and decrease the resulting uncertainty of the scored dose. For the clinical result presented in this paper, we have calculated two dose distributions: one with the air-kernel, and another one with the lead-kernel. Both distributions have been optimized in such a way to cover the target volume with the 100 % isodose surface.

**Results:** Experimental dose ratios for particular points with and without lead shielding in the central position of the applicator differ from MC calculated ratios by 1 % for points in close proximity and up to 10 % for distal points.

**Conclusions:** In this work, we demonstrated the increase in dose conformity using lead-shielded Intracavitary Rectal Mould Applicator for patients with locally advanced rectal carcinoma.