Purpose: Elekta/Nucletron introduced a new CT/MRI multi-lumen brachytherapy applicator to optimize dosimetry and treatment of vaginal targets. The design includes several peripheral channels isotropically placed 5mm inside cylinder surface with a separate central channel allowing single lumen brachytherapy as an option. We compared optimized dosimetry plans between single channel versus multi-channel to determine potential dosimetric advantages in vaginal cancer treatment after hysterectomy.

Methods: Patients were planned by CT simulation with each fraction of vaginal brachytherapy for postoperative endometrial cancer or vaginal cancer. Twenty CT cases representing five patients were compared. A single channel (standard) treatment approach was planned to the prescribed depth with the goal of providing maximal coverage to the tumor bed (the 5mm rind typically). Doses to the bladder and rectum were recorded by dose volume histogram. A second treatment plan was generated using a multichannel approach. The Oncentra brachytherapy planning system was used to generate both forward and IPSA inverse treatment plans. The target coverage percentage and doses to the bladder and rectum were optimized.

Results: The comparison demonstrates an improved V90, V95, V100 of the prescribed dose to the 5mm vaginal cuff rind was achieved in all cases. The average improvement in coverage was 9% (between 6-13%) for the cases evaluated. The multi-channel plan also reduced the maximal dose (hot spot) to the bladder and rectum within a range of 9-16% and 5-15% respectively. An increased non-critical vaginal mucosal dose of up to 75% was delivered as a result of the reduced bladder and rectal exposure via multichannel procedure.

Conclusions: Optimization of vaginal cuff brachytherapy is possible by using a new multi-lumen vaginal cylinder. The new device can increase the therapeutic ratio by improving target coverage with a reduction in the potential toxicity of hot spots to the adjacent organs.