Purpose: Nucletron's Oncentra Brachy Applicator Modeling plugin (AMp) may facilitate HDR cervical brachytherapy treatment planning when image artifact inhibits dwell position localization. The AMp utilizes a 3D CAD rendering of the corresponding applicator to define possible source dwell positions. This study compares the equivalence of source localization within a CT/MR Fletcher-type tandem and ovoid applicator utilizing clinical practice and Oncentra's AMp in a water phantom containing OAR surrogate structures.

Methods: KVCT image sets were acquired of a water phantom containing bladder and rectum surrogates as well as an assembled Nucletron Fletcher CT/MR applicator with various ovoid sizes (20, 25, 30mm) and a 30º tandem. Using Oncentra's Brachy TPS, OAR-surrogates were segmented and catheters were reconstructed using (1) clinical protocols (i.e. using source dwell position markers) and (2) using the AMp. Treatment plans were generated following clinical protocol, ensuring 600cGy to the ICRU 38-defined Point A. The center coordinates of each active dwell position were spatially compared. The dosimetric impact of these differences was quantified by determining D0.1cc, D1cc and D2cc for the surrogate OARs.

Results: Preliminary results obtained for the 25mm ovoid / 30º tandem applicator show 80% of dwell positions defined by clinical protocol and the AMp agree within 1mm with a maximum deviation of 1.17mm. Differences in source positions resulted in an increase of 2.9%, 0.48% and 0.3% and 0.66%, 0.87%, and 0.59% for D0.1cc , D1cc and D2cc for the bladder- and rectum-surrogates, respectively, when utilizing the AMp rather than clinical protocol for source position localization.

Conclusions: Preliminary results indicate that source dwell position localization utilizing Nucletron's Applicator Modeling plugin and our clinical protocol results in equivalent dosimetry for the simple, water phantom geometry investigated. Currently we are investigating the validity of this conclusion utilizing ovoids of different sizes as well as a CT/MR-compatible vaginal cylinder.