

## ABSTRACT

### **Title: A dosimetric study investigating the impact of catheter displacement in HDR prostate brachytherapy**

**Purpose:** During prostate cancer treatment with HDR brachytherapy catheters are inserted into the prostate. Between planning, and treatment, catheters can displace inferiorly due to edema or swelling of the prostate. If this is not detected, then treatment proceeds without correcting the catheter displacement and in turn an incorrect treatment is delivered. The purpose of this study was to investigate the consequences of catheter displacement on prostate coverage and contribution to critical structures.

**Method:** Ten patient plans were selected in which movement of the catheters had been observed. The original treatment plan generated using Nucletron PLATO (v14.3.2) was adjusted with catheter offsets of 5, 10, 20, and 30 mm from their original position (inferiorly). The original treatment dwell times were re-entered into the offset plans to show the dose consequence of the displacement. DVH data was calculated on the prostate, rectum, urethra and bladder.

**Results:** Prostate V100 began at 99% and decreased to 36% over the ten patients studied. For the urethra, the D10 increased (114.1% to 128.2%), as did the V125 (2.7 to 12.8%). In the rectum the V75 initially increased as the catheters shifted from 0 to 10 mm inferiorly (from 5.3 to 6.4%), but dropped as the shift increased from 20 to 30 mm (6.0 to 4.0%). In the penile bulb the V75 increased as a function of shift (from 2.1 to 44.8%).

**Conclusion:** Every effort should be made to ensure that the catheters do not move during prostate treatment. A small shift, 5 mm, would result in a small deviation of the dose distribution. In this case a re-optimization of the plan is unnecessary. Larger shifts will have a serious impact on the dose delivered to the prostate and sensitive normal structures.