On the Feasibility of Treating to a 1.5 cm PTV for Accelerated Partial Breast Brachytherapy With a Commercial Single Entry Hybrid Applicator

Kent A. Gifford, PhD1, Christopher L. Nelson, PhD1, Steven M. Kirsner,MS1, Elizabeth S. Bloom, MD2. 1Radiation Oncology, The University of Texas M.D. Anderson Cancer Center, Houston, TX; 2Radiation Oncology, The University of Texas M.D. Anderson Cancer Center, Houston, TX.

Purpose: To evaluate the dosimetric parameters when performing a 1.5 cm PTV_EVAL expansion of surgical cavities for APBI patients treated with the SAVI device.

Materials and Methods: 30 patient plans were retrospectively planned with a 1.5 cm PTV expansion. Patient plans included 6-1 (4), 8-1 (15), and 10-1(11), SAVI applicators. The treatment planning goal was to achieve at least 90% of the prescription dose (340 cGy) to the 1.5 cm expansion1. The PTV_EVAL was defined as a 1 cm volumetric expansion around the periphery of the SAVI device edited 2 mm in from the skin surface and limited by posterior breast tissue. The PTV_EVAL_1.5 was defined as a 1.5 cm volumetric expansion around the periphery of the SAVI device edited 2 mm in from the skin surface and limited by posterior breast tissue. The skin was defined by contracting the external surface of the patient by 2 mm to create a rind of tissue extending from the skin surface to 2 mm in depth. This 2 mm rind was then limited to the superior (left or right) quadrant of the body of the patient depending on which side the device was implanted. Dosimetric parameters evaluated included: 90%, 95%, 100% of the Rx dose for the PTV_EVAL and PTV_EVAL_1.5, V150 and V200 in cc of the PTV_EVAL and PTV_EVAL_1.5, and skin and rib maximum doses (0.1 cc max dose). V150 and V200 of the PTV_EVAL_1.5 were plotted against PTV_EVAL volume. Based on the NSABP B-39/RTOG 0413 protocol1 and the data of Wazer et al.2-4 a criterion was developed for the V150 and V200 of the PTV_EVAL_1.5. This criterion was that the PTV_EVAL_1.5 was not to receive more than 55 cc of V150 while V200 was not to exceed 22 cc. Treatment plans where V150 and V200 exceeded this criterion were flagged as unachievable.

Results: 13 of 30 treatment plans were achievable based on the 90% e 90% and the V150 and V200 of the PTV_EVAL_1.5 criterion. Of the 17 plans labeled as unachievable, the predominant factor was PTV_EVAL volume greater than 92 cc.

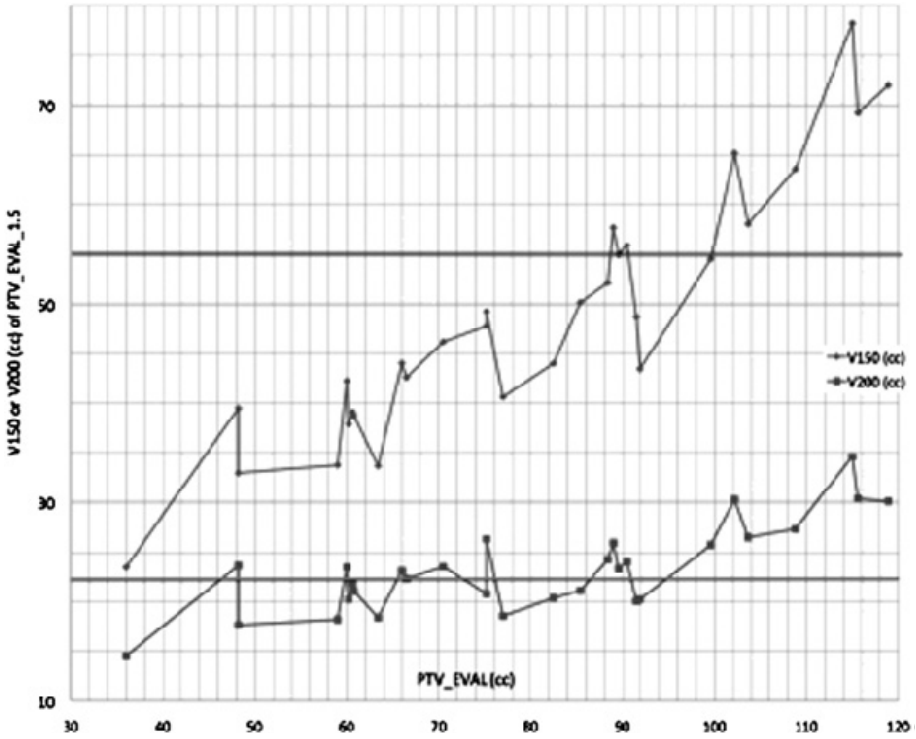

Figure 1 demonstrated that the PTV_EVAL volume less than 92 cc determined 1.5 cm expansion of the PTV_EVAL achievability. For the achievable plans, the median PTV_EVAL volume was 63.4cc. The

median V150 and V200 values of the PTV_EVAL_1.5 were 39.1 cc and 20.2 cc, respectively. Median skin and rib max doses (0.1 cc max dose) were 112.29 % and 108.27 %, respectively. Median PTV_EVAL_1.5 coverage was as follows: 90.36 %, 85.76 %, and 80.79% of the Rx dose for 90%, 95%, and 100% of the PTV_EVAL_1.5 volume.

Conclusions: In this cohort of patients, treating to a 1.5 cm PTV_EVAL was achievable approximately 43% of time. In the clinical setting where interstitial catheter implantation is not available and whole breast radiation therapy is not desired, treating to 1.5 cm PTV_EVAL with a SAVI device may be a viable option depending on cavity volume.