

# Strut-based partial breast irradiation with the SAVI catheter: A multi-center experience with marginal lumpectomy cavity-to-skin distance

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## PURPOSE

We report our experience in utilizing the SAVI breast brachytherapy device (multi-lumen catheter) in a multi-physician, multi-center setting for women with cavity-to-skin distance  $\leq 6$ mm.



Fig. 1 - SAVI Applicator (model 8-1; 8 expanded source lumens and a central source lumen)

## METHODS AND MATERIALS

In 2009, 87 consecutive women with newly diagnosed breast cancer elected to undergo lumpectomy plus partial breast irradiation with the SAVI breast brachytherapy applicator. 16 breast surgeons referred patients for brachytherapy at one of 5 facilities. Eligibility criteria: DCIS or invasive ductal carcinoma  $<3.0$  cm, unifocal, with negative margins and lymph nodes. A post-implant CT scan was utilized for treatment planning with Oncentra. Standard prescription parameters were followed with a goal of limiting skin dose to  $<100\%$  regardless of skin bridge thickness. Herein we report on the 18 women with cavity-to-skin distances of  $\leq 6$  mm.

## RESULTS

This series has a total of 87 patients accrued and treated as monotherapy using the SAVI breast brachytherapy applicator (34 Gy in 10 fractions of 3.4 Gy, BID). Dosimetry/treatment parameters for all patients and all subjects with 6 mm or less of skin bridge are reported in Tables 1 and 2 respectively.

All patients completed treatment without difficulty. For this subset of patients, mean minimum skin distance was 4.6 mm (range 2-6). Mean % maximum skin dose was 78% (range 53%-99%). Mean PTV was 62.6 cc (range: 32-153). Mean V90 was 91%. Mean V150 and V200 were 19.8 cc and 9.6 cc, respectively. Mean rib distance was 16.5 mm (range 0-50). Mean % maximum rib dose was 60.8% (range 16%-115%). At a mean f/u of 11.4 months (range 5-21), 18 of 18 patients in this subset are cNED.

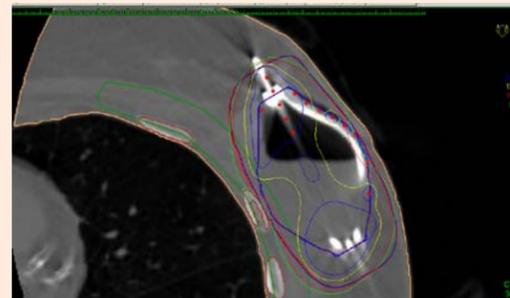


Fig. 2 - 4 mm skin bridge / 2 mm rib spacing

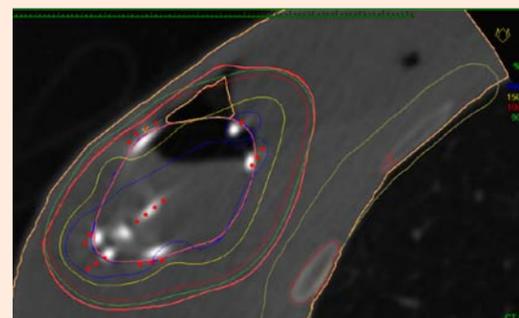


Fig. 3 - 5 mm skin bridge

Table 1:  
Treatment Plan Parameters for  
All Subjects (n=87)

Parameter	Mean	SD	Min	Max	Median
PTV volume (cc)	87.7	35.8	36.6	185.7	79.5
V90 (%)	92.7	5.8	65.4	99.8	93.7
V150 (%)	38.6	8.0	13.5	55.4	38.9
V200 (%)	19.2	5.7	0.3	31.6	19.8
Maximum dose to skin (cGy)	2295	873	1020	3742	2043
Maximum dose to skin (%)	67%	26%	30%	110%	60%
Minimum distance to skin (mm)	13.3	7.1	1.0	32.0	14.0
Minimum distance to rib (mm)	17.1	13.5	0.0	51.0	14.0

Table 2:  
Treatment Plan Parameters for  
Subjects with skin distance  $\leq 6$  mm (n=18)

Parameter	Mean	SD	Min	Max	Median
PTV volume (cc)	62.6	34.0	32.3	152.9	48.4
V90 (%)	91.1	5.6	78.6	99.5	91.5
V150 (%)	19.8	7.9	9.0	34.8	18.8
V200 (%)	9.6	3.5	4.2	16.6	9.4
Maximum dose to skin (cGy)	2661	437	1802	3366	2754
Maximum dose to skin (%)	78%	13%	53%	99%	81%
Minimum distance to skin (mm)	4.6	1.3	2.0	6.0	4.3
Minimum distance to rib (mm)	16.5	13.7	0.0	50.0	14.5

## DISCUSSION

Figures 2 & 3 to the left show screenshots of treatment plans in two patients. Figure 2 shows a patient with a narrow (4 mm) skin bridge in a cavity extending to the chest wall. The skin dose and chest wall doses were both maintained at less than 100% of the prescribed dose, which clinical data indicate will reduce the risk of skin and chest wall toxicity.

## CONCLUSION

The SAVI device is a strut-based brachytherapy applicator, which affords the radiation oncologist greater control over radiation dose delivery and therefore, the ability to offer APBI to a broader population of women. In our experience, women with skin bridges as small as 1-2 mm were successfully treated with excellent dosimetric treatment parameters.

Our clinical experience demonstrates that the SAVI applicator can be utilized in a multi-center, multi-physician setting with excellent, consistently reproducible results. The multi-lumen characteristic offers the ability to treat women who, because of either breast size or tumor location, would not have previously been able to meet the dosimetric criteria to undergo APBI. Local control has been excellent on short-term follow up. Follow up will continue in this study/patient cohort.

## ACKNOWLEDGEMENT

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