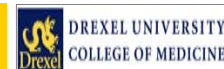


# Dosimetric Effects of Nonsymmetrical Openings of Multicatheter Breast Brachytherapy Applicators

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## Purpose/Objective

The Strut Adjusted Volume Implant (SAVI, Cianna Medical, Inc., Aliso Viejo, CA) brachytherapy applicator is used for accelerated partial breast irradiation with a high dose rate remote afterloader. It is composed of multiple struts forming an ellipsoid around a central lumen. The applicator comes in four sizes (see below). Occasionally the applicator may not open symmetrically, resulting in inverted or splayed struts. The purpose of this study is to investigate the resulting dosimetry, particularly with regard to hot spots, that may result as a consequence of nonsymmetrical openings of the applicator.

## Materials and Methods

A CT scan was performed on an applicator of each size. In each case the planning target volume (PTV) was defined as the volume extending from the periphery of the applicator to 1.0 cm from the ellipsoid formed by the fully opened struts. Three plans were generated from each scan. The first plan was for the complete and symmetrical opening of the struts. The second plan excluded one of the struts in the dose optimization simulating an inverted or splayed strut. The third plan excluded two adjacent struts, thus simulating two struts splayed away from each other. Eight dosimetric parameters were studied:  $D_{100}$ ,  $V_{100}$ ,  $V_{150}$ ,  $V_{200}$ ,  $V_{250}$ ,  $V_{300}$ ,  $V_{350}$ , and the volume outside the PTV receiving the prescribed dose ( $V_{out}$ ).

## Results

Applicator	Number of Excluded Struts	$V_{PTV}$ (cm <sup>3</sup> )	Min Dose to PTV (Gy) (% of Rx)	$V_{100}$ (cm <sup>3</sup> ) (% of PTV)	$V_{90}$ (% of PTV)	$V_{95}$ (% of PTV)	$V_{105}$ (cm <sup>3</sup> )	$V_{200}$ (cm <sup>3</sup> )	$V_{250}$ (cm <sup>3</sup> )	$V_{300}$ (cm <sup>3</sup> )	$V_{350}$ (cm <sup>3</sup> )	$V_{out}$ (cm <sup>3</sup> )
10 - 1	0	119.2	3.20 94.1	117.5 98.4	100	99.9	49.8	19.5	8.4	4.7	3.1	20.4
	1	119.2	3.10 91.2	116.2 97.8	100	99.6	48.8	18.3	8.3	4.5	3.0	20.4
	2	119.2	2.95 86.8	115.3 96.5	99.8	99.1	45.4	15.1	7.3	4.0	2.5	20.5
8 - 1	0	81.1	3.30 97.1	80.5 99.2	100	100	37.2	14.5	5.7	3.2	2.2	28.3
	1	81.1	3.23 95.0	79.0 97.7	100	99.8	34.5	12.3	4.8	2.5	1.5	12.5
	2	81.1	3.23 95.0	79.2 97.7	100	99.9	32.2	9.4	2.5	1.3	1.0	12.6
6 - 1	0	60.2	3.17 93.2	58.5 96.9	100	99.6	27.8	12.8	6.6	4.1	3.0	11.1
	1	60.2	3.08 90.6	59.5 98.7	99.9	99.5	32.6	15.8	8.5	5.1	3.1	11.5
	2	60.2	3.08 90.6	59.4 98.5	99.9	99.6	27.9	12.2	4.3	2.1	1.3	11.5
6 - 1 mini	0	44.9	3.36 98.8	44.8 99.7	100	100	23.7	12.9	7.2	3.8	2.3	15.7
	1	44.9	3.17 93.2	43.5 96.3	100	99.5	21.0	10.6	5.3	2.7	1.7	6.9
	2	44.9	3.17 93.2	44.1 98.0	100	99.8	21.5	10.5	4.8	1.9	1.1	6.8

PTV = planning target volume; Rx = prescription



Applicator	Length (cm)	Diameter (cm)
10 - 1	7.5	5.0
8 - 1	6.7	4.0
6 - 1	6.1	3.0
6 - 1 mini	5.0	2.4

## Conclusions

Due to the differential loading capability of the peripheral struts as well as the central lumen, no increase in hot spots either inside or outside the PTV is observed due to the introduction of applicator asymmetry. Thus, even if the applicator opens with inverted or splayed struts, a perfectly acceptable plan may be generated and the patient may be treated appropriately.