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# Factors Improving Skin Sparing, Rib Sparing, and D95 Coverage in Accelerated Partial Breast Irradiation Across Five Catheter Subtypes

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## Purpose

Accelerated partial breast irradiation (APBI) using balloon and strut-based applicators show promising results with excellent tumor control and minimal toxicity. A higher dose to 95% of the planning target volume (D95) is important in achieving tumor control. Achieving better cosmetic outcomes and reducing toxicity requires reduction in normal tissue exposure. Knowing the factors that contribute to a high skin dose, rib dose, and D95 coverage may reduce toxicity, improve tumor control, and help properly predict patient outcomes following APBI.

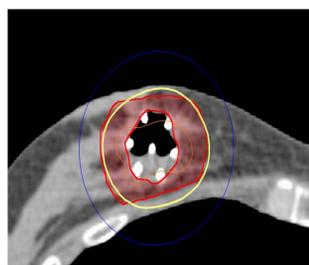


## MATERIALS AND METHODS

A retrospective analysis of 541 patients treated with brachytherapy based APBI at a single institution from May 2008 to January 2014 was grouped by applicator subtype. There were 438 strut based implants (SAVI) including SAVI 6-1 mini, 6-1, 8-1, and 10-1 devices, but because of SAVI 6-1 mini's unique size it was separated into its own group.

Patients were treated to a total of 34 Gy (3.4 Gy x 10 fractions over 5 days delivered BID) targeting a PTV 1cm beyond the lumpectomy cavity using a high dose rate source. Minimum treatment planning goals for the planning target volume were initially D90>90%; in October 2011, PTV coverage goals adjusted to D95>95%.

SAVI 6-1 device with typical PTV-Eval in red and 100% isodose curve in yellow



## RESULTS

All patients successfully completed APBI as prescribed. Max rib and skin doses were recorded (Figure 1). PTV was compared to D95, max rib dose, and max skin dose in each patient using Pearson's correlation coefficient (Table 1).

Figure 1: Percent of patients within a maximum dose range across applicator subtype

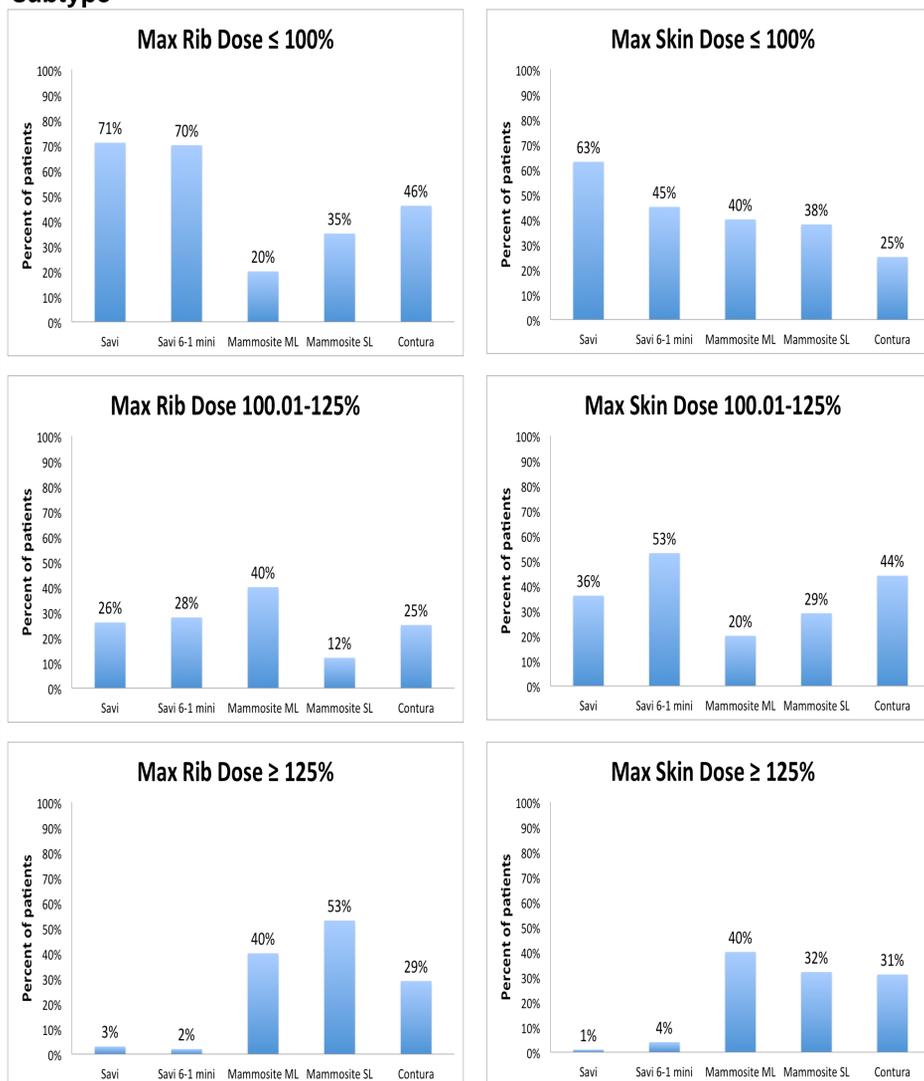


Table 1: PTV vs D95, max rib dose, and max skin dose across applicator subtype

	Savi 6-1 mini (n=233)		Savi (n=205)		Mammosite ML (n=10)		Mammosite SL (n=34)		Contura (n=59)	
	r	p	r	p	r	p	r	p	r	p
PTV (cc) vs. D95	.40	<.0001	.16	.0369	.97	<.0001	.10	.5666	.34	.0079
PTV (cc) vs Rib Dose %	-.30	<.0001	-.39	<.0001	-.85	.0009	-.22	.2167	-.31	.0174
PTV (cc) vs Skin Dose %	-.33	<.0001	-.15	.0272	-.99	<.0001	-.15	.3872	-.27	.0376

## RESULTS (continued)

Table 2: Patient Characteristics

Characteristic	
<b>Subjects</b>	541
SAVI	205
SAVI 6-1 mini	235
Contura	59
Mammosite Multi-Lumen (ML)	10
Mammosite Single Lumen (SL)	34
<b>Age</b>	
Median	62
Range	37-92
>60 years N (%)	294 (54.3%)
50-60 years N(%)	163 (30.1%)
40-50 years N(%)	83 (15.3%)
<40 years N(%)	1 (0.2%)
<b>Tumor Size (Cm)</b>	
Median	1
Range	0.1-6
<b>Grade</b>	
Median	2
Range	1-3
<b>Median PTV (cc) (Range)</b>	
Total	51 (17 - 154)
SAVI	58 (29 - 114)
SAVI 6-1 mini	41 (17 - 53)
Contura	81 (38 - 153)
Mammosite ML	60 (55 - 101)
Mammosite SL	92 (77 - 148)

## Conclusions

The data from this study shows PTV is positively correlated with max skin dose and max rib dose and negatively correlated with D95 across the strut based and multi-channel balloon applicators. Strut based applicators are significantly more effective in keeping skin and rib dose constraints under 125% and 100% when compared to any balloon based applicator.