Purpose: To evaluate the dosimetry of partial breast irradiation brachytherapy techniques using the Strut Adjusted Volume Implant (SAVI), Contura, and Tube and Button (T&B) applicators.

Methods: A total of 51 breast-cancer patients (23 SAVI, 6 Contura, and 22 T&B) were treated. The target was delineated following NSABP B-39 guidelines. 3D plans were optimized using the Inverse Planning Simulated Annealing algorithm to deliver 3.4 Gy per fraction to the target and minimize dose to organs at risk (OARs). Graphical optimization was then used to fine tune the final dose distribution. The minimum cavity-to-skin distance was measured. Target coverage (V90 and V95) and maximum dose (D0.1cc) to the OARs were evaluated. Dose homogeneity index (DHI = 1-V150/V100) was calculated.

Results: The average cavity-to-skin distances were 4.1 mm (0.5-9.6 mm, SAVI) and 11.7 mm (7.1-15.4 mm, Contura). The target-to-skin distance for the T&B cases was 8.7 mm (5.0-13.7 mm). The average V90 and V95 to the target were 96.8% and 94.5% (SAVI), 97.0% and 93.0% (Contura), 98.6% and 97.3% (T&B). The mean D0.1cc to the skin, ribs, and lung was 91.5%, 58.8%, 44.5% (SAVI), 93.1%, 51.3%, 40.5% (Contura), 69.1%, 41.5%, and 31.9% (T&B). The average V150 and V200 to the normal breast tissue were 30.4 cc and 14.9 cc (SAVI), 29.5 cc and 7.3 cc (Contura), 18.3 cc and 7.1 cc (T&B). The average DHI for the SAVI, Contura, and T&B cases was 0.55 (0.50-0.60), 0.70 (0.63-0.78), and 0.76 (0.74-0.79).

Conclusions: All techniques provided clinically acceptable target coverage and dose to the OARs. The SAVI device provided a lower skin dose at close cavity-to-skin distances while providing excellent target coverage. However, the T&B and Contura applicators produced more homogeneous dose distribution (higher DHI) in the target than the SAVI. The correlations between dosimetric properties and follow-up mammogram results are under investigation.