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Abstract Categories: 2. Breast **Presentation format:** Paper (7 minute presentation) **Financial Disclosure:** Yes, I have/had a financial interest, arrangement, or affiliation with a commercial organization that may have a direct or indirect interest in the subject matter of my presentation, as described below.

The applicator was provided to Tufts-NEMC and RIH for free on a temporary basis to assess its dosimetric and clinical potential. **Off label Disclosure:** I will not discuss or describe during my presentation at the above CME program a use of a medical device or pharmaceutical that is classified by the Food and Drug Administration (FDA) as investigational for the intended use. I will not discuss or describe during my presentation at the above CME program use of a medical device or pharmaceutical that is "off-label", e.g., a use not described on the product\'s label. I will specifically disclose that the FDA has not cleared the device or pharmaceutical for the specific "off-label" use. **Award:** I would not like to be considered for a resident travel award.

Title: STEREOTACTIC BREAST BRACHYTHERAPY APPLIED PERIPHERALLY USING A COMPRESSION APPLICATOR AND HDR ^{192}Ir

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Purpose: Breast brachytherapy has historically been applied via interstitial or intracavitary application. This approach produces conformal dose distributions through an invasive surgical procedure. By using peripherally positioned brachytherapy applicators to preferentially irradiate the lumpectomy cavity, breast brachytherapy may be applied without surgery while minimizing dose to critical structures such as the skin and chest wall. A novel applicator design applies teletherapy-like beam collimation with brachytherapy dose falloff. This study aims to characterize dose rate distributions through application of this surface applicator, and compare these results to current standard-of-care treatment techniques.
Materials and Methods: Treatment using the ART applicator positions the breast within two mammography paddles under compression to mimic the diagnostic geometry and affix the skin:source separation. Applicator diameters ranged from 5-7cm, and use a W-alloy collimator with a conventional HDR ^{192}Ir source. Skin separations ranged from 3-7cm. Dose rate distributions and skin dose relative to target dose were assessed using Monte Carlo (MC) methods and experimental techniques (ionization chambers and radiographic film). Using the MCNPv5 geometry package, the breast was modeled as a 16 cm diameter right cylinder with thicknesses of 3-7 cm in 0.5 cm increments. Dose rate was calculated in annular voxels 1 mm thick in 1 mm radial increments from 0.1 to 7.9 cm. Measurements were performed in a rectilinear acrylic phantom using a parallel plate ionization chamber to minimize dose gradient volume averaging in the depth direction. Radiographic film was positioned at various depths for direct comparison with the MC dose profile, and to confirm cylindrical symmetry.
Results: There was good beam uniformity within the collimated region. Surface and midplane collimation provided a factor of 8 and 5 attenuation, respectively. Ionization chamber measurements and MC-derived dose falloff agreed within 2%. Film measurements and MC-derived relative dose profiles agreed within 6%. Ratios of skin/target dose ranged from 0.5 to 1.1 over the wide range of applicator sizes and breast separations. For a typical 6 cm diameter applicator and 5 cm separation, the skin/target dose ratio was 0.74 with V_{50} < 50% and CTV DHI=1.00. Teletherapy and balloon APBI have DHIs of 0.95 and 0.70, respectively.
Conclusions: Compared to possibilities with other treatment modalities, the dose distributions, CTV DHIs, and normal tissue sparing are superior with this non-surgical approach.