

AbstractID: 5220 Title: Dose Differences Due to Air Pockets in MammoSite Treatments for Partial Breast Irradiation

Purpose: To evaluate the effect of air pockets on the delivered dose for MammoSite® treatments using Monte Carlo (MC) calculations, conventional treatment planning system (TPS), and TLD measurements.

Method and Materials: A solid water phantom was designed and fabricated to simulate a MammoSite® treatment with an air pocket outside the balloon. Dose measurements were performed using TLD-100s with dimensions of 3 mm x 3 mm x 0.9 mm and sensitivity of $\pm 3\%$. The phantom was composed of twelve slabs of 30 cm x 30 cm Plastic Water with varying thicknesses to provide different measurement distances from the balloon surface. The balloon volume was 34 cc, with a diameter of 4 cm. No contrast medium was added to the balloon to avoid possible dose effects due to the contrast. Hemisphere-shaped air pockets with different radii were milled on top of the balloon surface. An MC algorithm with geometric modeling based on the phantom design was created for dose comparison. The dose discrepancies from the TPS, TLD measurements, and MC calculations were compared.

Results: For a 25 mm air pocket, measured doses from TLDs at various locations of the customized phantom and MC results agreed with each other. The maximal discrepancy between TLDs and MC at different measured points was 3.68%. Dose differences between TPS and MC calculation at the air pocket was 6.37%, and less than 5% at locations other than air pockets. Doses will also be shown for a larger air pocket (5 mm radius).

Conclusion: The air pocket located outside of MammoSite® balloon does affect the dose to surrounding tissue and this dose can be represented using MC calculations.