

AbstractID: 1806 Title: Monte Carlo Investigation of Heterogeneity Correction in the Dosimetry of MammoSite® Brachytherapy

MammoSite is a high-dose rate brachytherapy procedure for partial breast irradiation after a breast conserving surgery or lumpectomy. It uses a balloon filled with radiopaque iodine-based contrast solution and catheter for insertion of ^{192}Ir high dose rate source. The radiopaque material helps visualizing the balloon contour, catheter, and source position within the balloon, which is essential for CT-based treatment planning and for daily QA using x-ray imaging. Because of the high content of iodine in contrast media, significant absorption and attenuation of photons may take place within the balloon, which would affect the resultant dose rates in tissue outside the balloon. The impact of heterogeneity correction to account for the radiopaque solution on the physical dosimetry of this procedure along the bisector axis of the source is investigated in this study using MCNPX Monte Carlo simulation. Calculations were based on a 30-cm diameter water sphere phantom. The source geometry was based on a commercially available ^{192}Ir source. Radiopaque solution concentration was varied from 5 to 25% by volume. Balloon diameters of 4, 5 and 6 cm were simulated. Dose rates per unit air-kerma strength were calculated in 1-mm scoring bin steps. The dose rate reduction at the typical prescription line of 1 cm away from the balloon surface ranged from -0.6% for the smallest balloon diameter and contrast concentration to a maximum of about -5.7% for the largest balloon diameter and contrast concentration, relative to a water-filled balloon.