AbstractID: 1538 Title: Dose Non-Uniformity on Prescription Surface and Skin for Balloon Catheter Brachytherapy for Breast Cancer

Brachytherapy using a balloon catheter and an ^{192}Ir-high dose rate source has recently become available for early-stage breast cancer patients. Due to the lack of scatter medium and the attenuation by the contrast medium in the balloon, potential underdose to the breast tumors is a major concern. Using Monte Carlo (MC) techniques we investigated dose non-uniformity on the prescription surface and the variation of skin dose due to such inhomogeneities. Breast/lung phantoms containing these inhomogeneities were assumed in the MC simulations, and doses in the breast and lung were calculated. Doses were also calculated by a commercial treatment planning system (TPS). The MC doses and the TPS doses were compared at the prescription points along the transverse and longitudinal axes of the source and at the breast skin. The air-kerma strength per unit activity was determined 9.79×10^{-8} U Bq^{-1}, which was used to calculate absolute MC dose rates at an activity of 4.082×10^{4} U. In the breast/lung geometry assumed in our MC simulations, underdosage was approximately 3%–9% on the prescription surface, depending on the skin-to-balloon surface distance of 5–15 mm and the geometry (either anterior, posterior, or sagittal). The 7%–10% overestimation of the skin dose indicates that target tissue between the balloon and skin may be inadequately treated for short balloon-to-skin distances. In addition, cosmetic problems and erythema seen on clinical trials occurred at a lower dose than previously thought.