COMPARISON OF HEART DOSE OF EBX AND MULTI-CHANNEL HDR BREAST APPLICATORS

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INTRODUCTION

The heart and lungs can be exposed to potentially significant doses during external beam and brachytherapy to the breast, where radiation tails drop steeply with distance from the source. While it is a common practice to limit patient exposure, determining the risk to the heart and especially that of the cardiac vasculature is not straightforward. Over the past several decades, dose to the heart from radiation therapy for left-sided breast cancer has been found to be a significant predictor of cardiac mortality. Thus it is of interest to attempt to quantify heart dose and explore any differences among the modalities available.

METHODS

A two-dimensional computer model was written in Lab VIEW to allow placement of an arbitrary number of sources in an arbitrary arrangement, representing the relative placement of the source(s) in a brachytherapy applicator. The model includes the ability to move the source(s) in interstitial or balloon based brachytherapy. For each source arrangement, the dose distribution at the heart was calculated by placing a water-equivalent material at the heart location and moving the source(s) to deliver a certain dose at a nominal distance to the heart.

RESULTS

In IORT breast treatments, shielding material may be placed in the cavity to shield the rib wall. In brachytherapy, the modulation of the heart is decreased significantly when the source is moved to the opposite side of the heart. The same is true for the lungs, with shielding materials in the lungs. The dosimetric effect on the heart and lungs is small when the source is placed at the periphery of the heart and lungs.

CONCLUSION

The heart and lungs can be exposed to potentially significant doses during external beam and brachytherapy to the breast, where radiation tails drop steeply with distance from the source. While it is a common practice to limit patient exposure, determining the risk to the heart and especially that of the cardiac vasculature is not straightforward. Over the past several decades, dose to the heart from radiation therapy for left-sided breast cancer has been found to be a significant predictor of cardiac mortality. Thus it is of interest to attempt to quantify heart dose and explore any differences among the modalities available.