ABSTRACT

Purpose: To determine the size of a balloon containing a residual air bubble in a balloon where treatment with the Xoft 50 kVp, AWB, has not been completed.

INTRODUCTION

• The Xoft®-Electron Brachytherapy (eBe) System has been in clinical use for over three years, delivering accelerated partial breast irradiation (APBI) using a balloon placed into the patient’s resection cavity post-lumpectomy using a miniature x-ray source.

• The determination of the size of a balloon containing a residual air bubble in a balloon where treatment with the Xoft®-Electron Brachytherapy (eBe) System has not been completed is important for treatment planning and evaluation.

MATERIALS AND METHODS

• The Xoft®-Electron Brachytherapy (eBe) System has been in clinical use for over three years, delivering accelerated partial breast irradiation (APBI) using a balloon placed into the patient’s resection cavity post-lumpectomy using a miniature x-ray source.

• The determination of the size of a balloon containing a residual air bubble in a balloon where treatment with the Xoft®-Electron Brachytherapy (eBe) System has not been completed is important for treatment planning and evaluation.

RESULTS

• Small residual air bubbles in the Xoft®-Electron Brachytherapy (eBe) System have not been completed.

CONCLUSIONS

• Small residual air bubbles in the Xoft®-Electron Brachytherapy (eBe) System have not been completed.

• Residual air bubbles of less than 2 mm tall x 4 mm in diameter would have an negligible overall effect to a treatment plan.

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• Residual air bubbles greater than 8 mm in tall and greater than 8 mm in diameter should be removed or reduced during the CT simulation and dosimetry planning and evaluation steps.

The TG-43 shift method was confirmed using the MCNPX model to be acceptable for a first order approximation of the dose above an air bubble in a balloon.

Clinical Significance Of Air Bubbles In Breast Balloons For The Xoft 50 kV Brachytherapy Source Determined By TG-43 And MCNPX Modeling

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1.50

1.75

1.00

0

-0.5

-1

-1.5

-2

-2.5

-3

-3.5

-4

Off-center distance: 0 mm

Off-center distance: 20 mm

Off-center distance: 10 mm

Figure 2: The increase in dose with height of air bubble.

Figure 4: Typical weighting for a multi-dwell point source.

Figure 5. Including the effect of the oblate spheroid geometry of the bubble in a

Figure 1. The increase in dose with height of air bubble.

Figure 3. The increase in dose with height of air bubble.

Figure 6. The increase in dose with height of air bubble.

Figure 7. Typical weighting for a multi-dwell point source.

Figure 8. The increase in dose with height of air bubble.

Figure 9. The increase in dose with height of air bubble.

Figure 10. The increase in dose with height of air bubble.