IMF BREAST WEDGE™

Towards Higher Quality Breast Radiotherapy Treatments: A First Evaluation of the Newly Introduced Inframammary Fold Breast Wedge™ Device from QLRAD.

Ramtin Zakikhani, MS[1]; Thomas Furno, RTT[2]; Arjen Winkel[3]

[1]Genesis Care - Sarasota, FL [2]Sarasota Memorial Hospital - Sarasota, FL [3]QLRAD – Miami, FL

ABSTRACT

The purpose of this study is to quantify the dosimetric impact of the newly introduced "Inframammary Fold (IMF) Breast Wedge™" device by QLRAD Inc. in the region of the inframammary fold during breast radiotherapy.

A phantom composed of rolled bolus and solid water was used to simulate a patient's breast on the chest wall.

Dose calculations in the treatment planning system and TLD measurements with this phantom were performed to determine the dose with and without the IMF Breast Wedge at the inframammary fold.

Measured and calculated results showed a significant reduction in radiation dose absorbed at the chest wall when the IMF Breast Wedge was positioned between the breast and chest wall.

Figure 1. Inframammary fold Breast Wedge™.

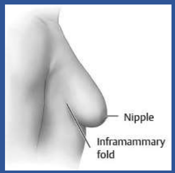

Figure 2. The Inframammary Fold (IMF).

CONTACT

Ramtin Zakikhani, MS DABR
Genesis Care - Sarasota
3210 Fruitville rd., Sarasota, FL, 34237
Ramtin.Zakikhani@21co.com
941-364-8887

INTRODUCTION

The newly introduced "Inframammary Fold Breast Wedge™ " device by QLRAD inc. (figure 1) is an innovative device that is used for breast radiotherapy.

It is intended to be placed between the breast and chest wall to create a physical separation in order to reduce the dose to the chest wall and inframammary fold (figure 2) which can experience skin toxicity from radiation exposure in regular supine setups.

The Inframammary Fold Breast Wedge™ can also be used at other skin folds throughout the body to provide a similar benefit.

Studying the dosimetric impact of this new device under radiation is essential to validate its proposed benefits of reducing the dose delivered to the inframammary fold during whole breast radiotherapy.

METHODS AND MATERIALS

The IMF Breast Wedge™ is an air equivalent (–900 HU) foam and is intended to be placed between the breast and chest wall to create a separation (figure 3).

A breast phantom was created by using sheets of folded bolus. The sheets of folded bolus were then placed on top of flat plates of Solid Water™ totaling 11 cm in thickness. The sheets of folded bolus created a breast phantom that was approximately 14 cm wide, 14 cm long and 6 cm high. The Solid Water™ immediately under the folded bolus simulated the chest wall (figure 4).

A clinical, two field, tangential step and shoot, radiation treatment plan was created with Varian's Eclipse™ TPS software and delivered with a Varian Truebeam™ linac for a setup with (figure 5) and without the IMF Breast Wedge™ (figure 6).

Thermoluminescent (TLD) dosimeters (figure 7) were placed at various locations on the breast phantom to measure the dose delivered by the radiation treatment plan and then compared to the calculated dose in the treatment planning system.

Figure 3 (1-3). Patient sim with the IMF Breast Wedge™.

Figure 3.1 Rotated Axial view.

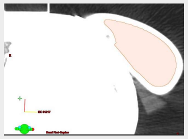

Figure 3.2 Axial view.

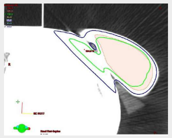

Figure 3.3 Isodose lines example on Axial view.

RESULTS

A reduction of dose was found at the chest wall by almost 85% when the IMF Breast Wedge™ device was present in the treatment plan (26.8 cGy) compared to the plan without the device (173.0 cGy).

The TLD measurements showed a similar effect when the IMF Breast Wedge™ was placed (26.5 cGy vs 159.0 cGy) to create a separation between the breast and chest wall with a dose reduction of about 83%.

These results (table 1) are due to the air equivalent nature of this device.

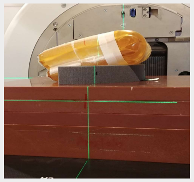

Figure 4. Lateral view of the breast phantom on the IMF Breast Wedge™ over Solid Water™ (simulating the chest wall).

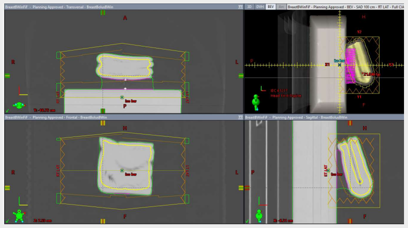

Figure 5. Breast phantom on the IMF Breast Wedge™ in the TPS.

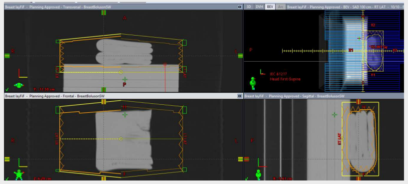

Figure 6. Breast phantom lying on the "chest wall" (Solid Water™) in the TPS.

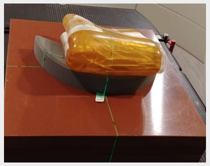

Figure 7. Phantom with TLD's placed under the IMF Breast Wedge™ .

	Eclipse calculated dose diff (%)	TLD measured dose diff (%)
% Difference in "Chest Surface" dose when using the Large IMF BW (Dose on SW)	-84.5	-83.4

Table 1. Measured and calculated results obtained from both breast phantom setups.

DISCUSSION

Initial evaluation of the Inframammary fold Breast Wedge™ in the clinic has shown that this device may help reduce or eliminate skin reactions during breast radiotherapy (figure 8 and 9) as the air gap that is created with the IMF Breast Wedge™ can reduce the scattered radiation dose to the inframammary skin fold since the IMF Breast Wedge™ is made of an air equivalent material.

The IMF Breast Wedge™ is held in place by the breast. It is used during planning and every treatment fraction for the patient.

Calculations with the Eclipse™ AAA treatment planning system and measurements with TLD's have shown that the IMF Breast Wedge™ will reduce the dose to the surface of the chest by approximately 84% when using the large IMF Breast Wedge™.

Other solutions exist to reduce the dose to the inframammary fold of the breast that can be more complex and less reproducible than the IMF Breast Wedge™.

QLRAD's IMF Breast Wedge™ has also been used in the clinic to help separate any skin fold throughout the body to reduce their resulting bolus effect. These other sites include separating the scrotum from the thigh, between the upper arm and thorax and also in the neck region during HN RT.

Figure 8. Example of dry desquamation.

Figure 9. Example of moist desquamation.

CONCLUSIONS

Use of this novel device reduced the dose to the chest wall significantly and could extend to other skin folds throughout the body treated with a similar technique. The benefits of reduced dose to skin folds should lead to improved patient treatment outcomes through lower skin toxicity and reduced treatment breaks.

REFERENCES

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