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EASTERN TIME [GMT-4]

In vivo dosimetry with XR-RV3 radiochromic films in intraoperative radiotherapy

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INTRODUCTION AND AIM

To carry out treatment verification and in vivo dose measurements in intraoperative breast radiotherapy patients, treated with the Axxent (Xoft Inc.) equipment with 50 kVp of energy with XR-RV3 radiochromic films model.

METHOD

Dosimetric measurements were performed *in vivo* with XR-RV3 radiochromic films in 20 patients to determine the skin dose in IORT with Axxent.Gafchromic XR-RV3 radiochromic films are specific for measurements in the low energy and high dose range, the films were calibrated following the 3-channel method (Radiochromic.com) (Fig 1) to measure dose in vivo in patients with breast IORT.
The tratment prescription is 20 Gy on the balloon surface following the TARGIT study.
Four pieces of properly oriented films were placed on each patient to obtain skin doses at different points (Fig 2). The pieces were placed progressively from the area closest to the applicator to the furthest The process of converting the result into dose was carried out with an Epson Expression 12000XL scanner. The films were scanned before and after irradiation with five consecutive scans in both cases, in the case of those irradiated, 24 hours after irradiation.

RESULTS

- The skin doses obtained for all patients are shown in Table 1, these doses are lower than those estimated by the TPS (Eclipse, Varian Inc.) calculated with the Axxent specific parameters of TG-43.
- The doses of the film pieces placed on the balloon surface match the expected, i.e. 20 Gy, the prescribed dose.

Fig 1

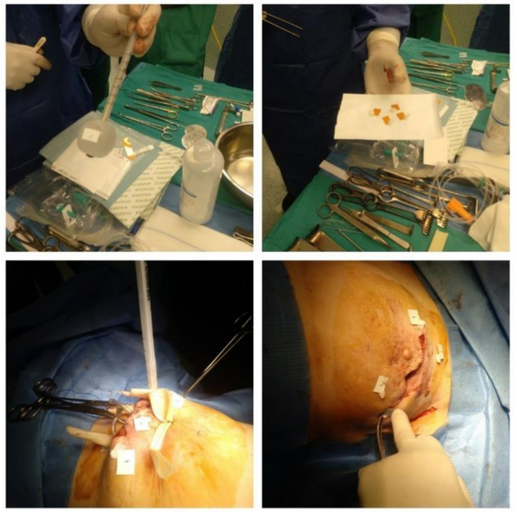
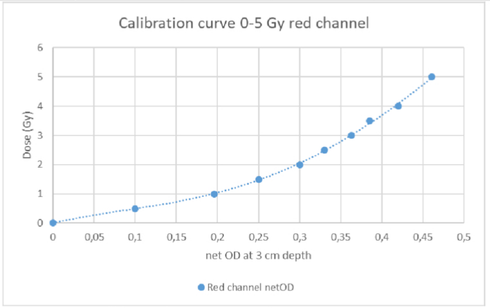


Table 1

Site of measurement	Average dose (Gy)	Dose Range (Gy)	SD (Gy)	Median Dose (Gy)
Applicator	19,8	18,9-21,5	0,7	20,1
1-2 cm applicator	1,82	0,9-3,8	0,09	1,63
2-5 cm applicator	0,71	0,4-0,9	0,03	0,76
>5 cm applicator	0,22	0,03-0,4	0,02	0,15



Calibration curve for skin films

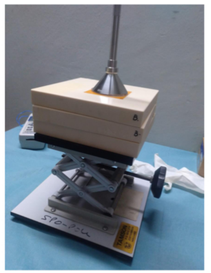


Fig 2

CONCLUSIONS

The skin doses are sufficiently low, which explains why in the more than 500 patients treated, less than 1% of the cases presented early toxicity of acute grade 3 dermatitis and no case of a higher grade.

The in vivo dosimetry procedure initiated will be performed with all patients measuring doses in other areas of interest from now on.

The viability of XR-RV3 films for "in vivo" dose measurement in this range of dose and energy in a complex procedure, such as breast IORT, was demonstrated. In addition, it was proven that the doses in risk organs are far below the tolerances for these cases and the safety for the patient of this type of treatment.

REFERENCES

1. Avanzo M, Rink A, Dassie A et al. In vivo dosimetry with radiochromic films in low-voltage intraoperative radiotherapy of the breast. Med Phys, 2012; 39: 2359-2368.
2. Farah J, Trianni A, Ciraj-Bjelac O, et al. Characterization of XR-RV3 GafChromic® films in standard laboratory and in clinical conditions and means to evaluate uncertainties and reduce errors. Med Phys. 2015;42 :4211-4226.
3. Gandía A, Lozares S, Font-Gómez JA et al. Breast treatments with Axxent equipment. Comparison with Mammosite for skin, lung and heart doce. Radiother Oncol.
4. Devic S, Liang L, Tomic N, et al. Dose measurements nearby low energy electronic brachytherapy sources using radiochromic film. *Physica Medica* 2019; **64**: 40–44. 2018; 127: S721.

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