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EXPERIMENTAL DETERMINATION OF SKIN DOSE IN BREAST PLANNED TREATMENTS BY VMAT AND FIELD-IN-FIELD TECHNIQUES BY THE USE OF TLD AND OSLD NANODOT

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Introduction: Skin dose in breast radiotherapy is one of the most important clinical factors to evaluate acute and late toxicity. The use of Volumetric Modulated Arc Therapy (VMAT) treatment technique on the breast has several dosimetric advantages but its impact on skin dose should be evaluated and compared to well-established treatment techniques using tangential fields. Purpose: To measure the skin dose using an anthropomorphic phantom. To evaluate through in vivo dosimetry the skin dose in different breast sizes (small, medium and large) with VMAT.

Material and method: The skin dose was measured using Thermoluminescent Dosimeter (TLD) and Optically Stimulated Luminescence Dosimeter (OSLD) in breast radiotherapy using an in-house anthropomorphic phantom. Novalis Tx linear accelerator with 6 MV was used as shown in Figure 1. Two different treatment techniques were used: Field-in-Field (FIF) modality, which consists of multiple segments with weight optimization and VMAT, based on the planning strategy proposed by Nicolini et al. Patient in vivo dosimetry with TLD and VMAT treatment technique was performed for different breast sizes.

Results: The homolateral phantom breast skin dose using both treatment techniques were equivalent as shown in Figure 2. OSLD measured doses by the VMAT technique were up to 10% lower than TLD. For region B corresponding to the homolateral breast, the measured dose by both techniques was equivalent to 99% for the phantom breast volume (small). The patient in vivo dosimetry with VMAT treatments was independent of the breast size. According to the treatment planning techniques and in vivo dosimetry the contralateral breast skin dose was 1% in FIF and 2.5% in VMAT concerning the prescribed dose.

Conclusions: The use of the VMAT technique in the treatment of early-stage breast cancer does not lead to skin dose increment. In addition, VMAT provides better dose-volume conformation and lung, heart sparing compared to FIF. In accordance with in vivo dosimetry, the mean dose of the homolateral breast skin was 62 ± 6% relative to the prescribed dose, regardless of the breast size.

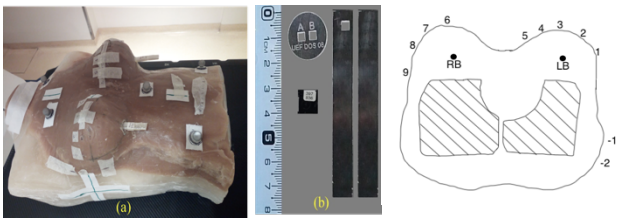

Figure 1: (a) Anthropomorphic chest phantom. (b) PMMA devices used for TLD and OSLD. Phantom axial view. The position of each detector can be identified.

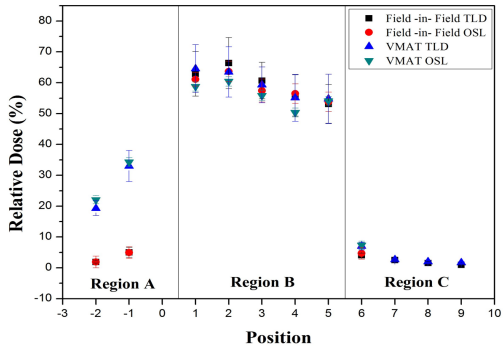

Figure 2: Relative dose to the PTV-SIB as a function of the dosimeter position

References:

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2. A.J. Kole, et al., *Breast Cancer Targets Ther*, **9**:313-23 (2017).