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# Dosimetric impact of positioning and anatomical modifications of patients treated for breast cancer using IMRT

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## Résumé

*Introduction :* Concerning breast cancer radiotherapy treatments, the main challenge is the localisation of the target volume subjected to potential anatomical changes and to positioning reproducibility difficulties. Therefore, choices have been made in our center to adapt the dosimetric planification method and the patient positioning. The main goal of this study is to evaluate the robustness of the treatment workflow retained. It includes an IMRT planification method using a "1cm extended PTV" (Nicolini-2011) and a positioning based on Surface Guided Radiotherapy (SGRT) plus a daily CBCT (SGRT+CBCT set-up based method). The robustness of a workflow using SGRT only was also evaluated in order to determine if the frequency of ionizing images for positioning, could be reduced (SGRT-only set-up based method).

*Material and methods :* Twenty left-sided breast cancer patients (40Gy prescribed in 15 fractions) were included in this study. They all received their treatment on a Halcyon linear accelerator (Varian Medical Systems), which enforces a CBCT image before each treatment session, equipped with a SGRT system (AlignRT, VisionRT). For dosimetric evaluation of the SGRT+CBCT set-up based method, the reference plan (approved for treatment) was recalculated on each daily CBCT (276 CBCTs in total) using the Eclipse TPS version 15 (Varian Medical Systems). Then, the cumulative dose distribution of all CBCT plans was calculated on the planning CT. For the evaluation of the SGRT-only method, the CBCT setup shifts were annulated, then, the same methodology was applied. Finally, the SGRT+CBCT and the SGRT-only plans were compared to the reference plan using a Wilcoxon statistical test assessing dose coverage for the breast CTV and PTV (V95%) as well as dose to OARs (heart: Dmean and V16Gy, left lung: Dmean and V17Gy).

*Results :* Regarding the breast CTV and PTV coverage, a statistical significant difference (p-value < 0.05) was found between the three compared plans, as shown in figure 1. However, the planning goal for CTV (V95% > 95%) is still respected for both SGRT+CBCT and SGRT-only modalities. But for the PTV, this condition is only respected with the SGRT+CBCT method. Concerning OARs, no statistical difference with the reference plan was found regarding the clinical goals for the SGRT+CBCT setup. For the SGRT-only method, a significant difference was found, but it is correlated to a worse coverage of the

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\*Intervenant

target volumes. Yet OARs clinical goals are still respected for both modalities.

*Conclusions* : The workflow implemented in our center including the "1cm extended PTV" planification method paired with SGRT+CBCT positioning is clinically robust against tissue deformation and positioning uncertainties. For the SGRT-only method, further analysis is being conducted regarding its practices, in order to consider implementing it in the future. Finally, the same work is in progress for tackling left-sided breast cancer patients with lymph nodes.

### **References**

1. Nicolini *et al.* Planning strategies in volumetric modulated arc therapy for breast. *Medical Physics*. **38**, 7 (2011).

**Mots-Clés:** SGRT, breast, robustness, daily CBCT, IMRT