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# PO-RT-26 Investigation of the influence of patient setup and anatomy variation on the dose reconstruction using two tomotherapy dedicated software tools: TomoGamma and TomoAdaptive.

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## Résumé

Investigation of the influence of patient setup and anatomy variation on the dose reconstruction using two tomotherapy dedicated software tools: TomoGamma and TomoAdaptive. M. Croisé, S. Losa, C. Wessels, A.Mazal

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**Introduction:** In helical tomotherapy workflow, for each treatment fraction, the planning kVCT image is compared with the daily MVCT image from the on-board detector. Both images have to match before starting treatment delivery. From one fraction to another, patient setup and anatomical variations may occur and lead to a non-negligible shift of the tumor position regarding the initial treatment plan. The daily MVCT is no longer in agreement with the kVCT on which the dose distribution has been planned. The purpose of this study is to investigate the sensibility of the software to detect these variations and in the end, be able to decide if a re-planning is necessary.

**Methods:** In this study, two tomotherapy dedicated software solutions are used: TomoGamma (21st Century Oncology), a transit dosimetry software that calculates a Gamma Index per fraction based on the MVCT detector data, and TomoAdaptive (21st Century Oncology), a radiotherapy adaptive software that reconstructs the dose distribution on the daily MVCT. The method consists of irradiating phantoms (TomoPhantom, RANDO phantom, and CIRS thorax) in helical tomotherapy with several levels of complexity (homogeneous phantom, heterogeneous phantom, with simple cylindrical PTV, complex dose distribution with avoidance area). For each case, several fractions are performed including the reference (correct setup and kVCT identical configuration), fractions with a shifted setup (in the three space directions from 5 to 20mm, and in rotation from 5 to 20°) and anatomical variations (reduction of bolus from 3cm to 0cm, addition of heterogeneities). The software’s sensibility is evaluated in comparison with an ionization chamber (A1SL, Standard Imaging) absolute dose measurement.

**Results:** Preliminary results show a good agreement between the Gamma Index (2%/2mm) and the absolute dose measurements for anatomical and geometrical variations in X and Z. However, TomoGamma seems to be less sensitive for Y shift and for rotation. At this stage,

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\*Intervenant

we succeeded to simulate the Gamma Index range of a typical group of breast tomotherapy treatments: a setup error of more than 5mm in X and Z, 10mm in Y direction, 5° in rotation and weight loss of more than 1cm generate a less than 95% Gamma Index. TomoAdaptive shows huge sensibility as Dose-Volume histogram differences between the modified fraction and the reference fraction are significant.

**Conclusion:** The sensibility of the software tools has been investigated for different levels of complexity. These preliminary results already show the software's capabilities to detect the variations as well as its limitations. Future work remains to improve precision with smaller step shifts, rotation and reduction of bolus measurements.

**Mots-Clés:** Adaptive tomotherapy, transit dosimetry