**Title:**

Adaptive Radiotherapy: evaluation of the dose actually delivered to the patient in a treatment of prostate cancer radiotherapy

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**Introduction:** During radiotherapy treatment for prostate cancer, variations in rectal and bladder volume are observed. These anatomical changes may lead to an increased risk of local recurrence and increased dose to organs at risk [1]. An evaluation of the dosimetric impact of these differences would reflect the need of re-planning in process treatment: it is the adaptive radiotherapy. The aim of this study is to evaluate the dose actually delivered to the patient throughout the treatment compared to that planned and estimate when a replanning of treatment is needed.

**Methods:** A planning CT and 23 CBCT corresponding to 23 radiotherapy treatment sessions were realized for each of the 7 patients of the study. A deformable registration of CT planning contours to 3 representative CBCTs was performed with commercial software (Version 3.6 XD3, Mirada Medical Ltd, UK). Dice index was calculated between deformed contours and those contoured by the same radiation therapist to evaluate the software used. Dose distributions were recalculated on each CBCT using the isocenter of treatment. Each dose distribution matrix was deformed from a CBCT to another in order to obtain the cumulative dose session after session. The generated DVHS were used to compare the cumulative dose with the planned one.

**Results: The obtained median Dice indices are 0.76 for the prostate, 0.7 for the rectum and 0.91 for the bladder. These results comply with the literature [2]. Concerning the cumulative dose on CBCTs, the study on the first two patients showed a delivered dose to the prostate lower than the planned one (Dmean: 44.85 Gy vs 46.15 Gy), a delivered dose to the rectum higher than the planned one (Dmean: 36.65 Gy vs 32.9 Gy) and constant for the bladder (Dmean: 31.15 Gy vs 31.75 Gy) at the end of the treatment. The results concerning other patients are in progress.**

**Conclusion:** **The goal of adaptive radiotherapy is that the planned dose actually matches the one delivered. The proposed method will allow evaluating in the case of treatment of prostate cancer if a new treatment planning is needed and when.**

**References:**

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[2] Castadot, Pierre, John Aldo Lee, Adriane Parraga, Xavier Geets, Benoît Macq, et Vincent Grégoire. 2008. « Comparison of 12 deformable registration strategies in adaptive radiation therapy for the treatment of head and neck tumors ». *Radiotherapy and Oncology* 89 (1): 1‑12.