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First author publications:

B. Rigaud, A. Simon, M. Gobeli, J. Leseur, D. Williaume, J. Castelli, C. Lafond, O. Acosta, P. Haigron, R. De Crevoisier, "Statistical shape model to generate a planning library for cervical adaptive radiotherapy", IEEE Transactions on Medical Imaging. (Review sent the 18th of July 2018)

B. Rigaud, A. Simon, J. Castelli, C. Lafond, O. Acosta, P. Haigron, R. De Crevoisier, "Deformable image registration for radiation therapy: principle, methods, applications and evaluation", Acta Oncologica. (Review sent the 20th of March 2018)

B. Rigaud, A. Simon, M. Gobeli, C. Lafond, J. Leseur, A. Barateau, N. Jaksic, J. Castelli, D. Williaume, P. Haigron, R. De Crevoisier, "A CBCT-guided evolutive library for cervix adaptive IMRT", Medical Physics (2018).

B. Rigaud, A. Simon, J. Castelli, M. Gobeli, J.D. Ospina Arango, G. Cazoulat, O. Henry, P. Haigron, R. De Crevoisier, "Evaluation of deformable image registration methods for dose monitoring in head and neck radiotherapy", BioMed Research International, Oncology (2015).

Current Project:

The aim of my PhD was to develop an optimized adaptive radiation therapy strategy for cervical cancer patients. During chemoradiotherapy and brachytherapy, the two parts of the standard treatment for this anatomical localization, large anatomical deformations may occur. These deformations are mainly explained by bladder or rectum filling, and tumor regression, and can hamper treatment precision. My work focuses on developing different approaches to take into account these anatomical deformations during treatment. These approaches rely on image processing tools such as deformable image registration (DIR), statistical

Current Projects *(cont'd)*

or feature extraction and data mining.

My work has led to two different new adaptive radiation therapy strategies. The first one takes advantage of a classic pretreatment planning library which can be enriched by triggering replanning during treatment, thanks to cone-beam computed tomography (CBCT). The second one relies on a patient specific modeled library which has been built with a population-based statistical shape model. The latter anticipates, at planning, systematic deformations of the uterus to improve the accuracy of treatment.

The last project of my PhD was to propose a biomechanical model-based DIR to estimate the deformations between radiotherapy and brachytherapy. During brachytherapy, an applicator is inserted into the patient anatomy for treatment delivery. This device induces large and complex anatomical deformations. The DIR can thus be used to find the anatomical correspondence (i.e., deformation vector field, DVF) between the two anatomies (with and without applicator). Then, the DVF can be used to map the different treatment doses toward a reference anatomy for planning, monitoring or population analysis.