ESTRO MOBILITY GRANT (TTG) REPORT

Title of the report: Advanced treatment planning approaches for breast cancer

HOST INSTITUTE:
Erasmus MC Cancer Institute, department of Radiation Oncology, Rotterdam, The Netherlands

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The main aim of my visit was to learn about iCycle, algorithm for automated, multi-criteria optimization of beam angles and IMRT fluence profiles, and investigate the possibilities for the improvement of breast cancer radiotherapy by developing techniques for automated treatment planning.

When I arrived in Rotterdam, I was enabled to start working in the best way at Erasmus MC immediately. Meetings were organized to talk about my project with expert physicists in automatic planning with iCycle and in planning for breast treatment at this institute.

During the meetings I was able to discuss the bibliographic research that I had done about autoplanning in breast cancer and it was very useful for my training.

To start, we decided to work on development of an automatic workflow for Intensity Modulated Radiation Treatment (IMRT) technique with two tangential beams.

I started with a training period to be introduced to iCycle

In iCycle the optimization is based on a user defined wish list which contains hard constraints and objectives with given priorities. Every element of the wish list consists of a specific cost function, a priority and a goal.

Constraints must be strictly met, otherwise the plan is considered invalid. Objectives are cost functions whose goals have to be met as much as possible without violating the imposed constraints. In iCycle the objectives are optimized one by one in order of priority, a later objective is optimized as far as it does not affect the result of the previous ones.

The wish-list construction is made in collaboration with physicians and technicians to ensure the generation of plans clinically acceptable and of good quality. For wish list generation the knowledge of the protocol used in the institute and how the physician does an evaluation of plan is essential and I had the possibility to attend this phase.

For this preliminary study, 10 patient data sets were selected from the Erasmus MC database of patients treated with surgery plus breast conserving therapy. These are left-sided patients and the CT-scan was acquired in deep inspiration breath-hold (BH).

The clinical plans were used as reference dose distribution for the selection of the objectives in the wish-list, and to start we used the clinical beams angles.
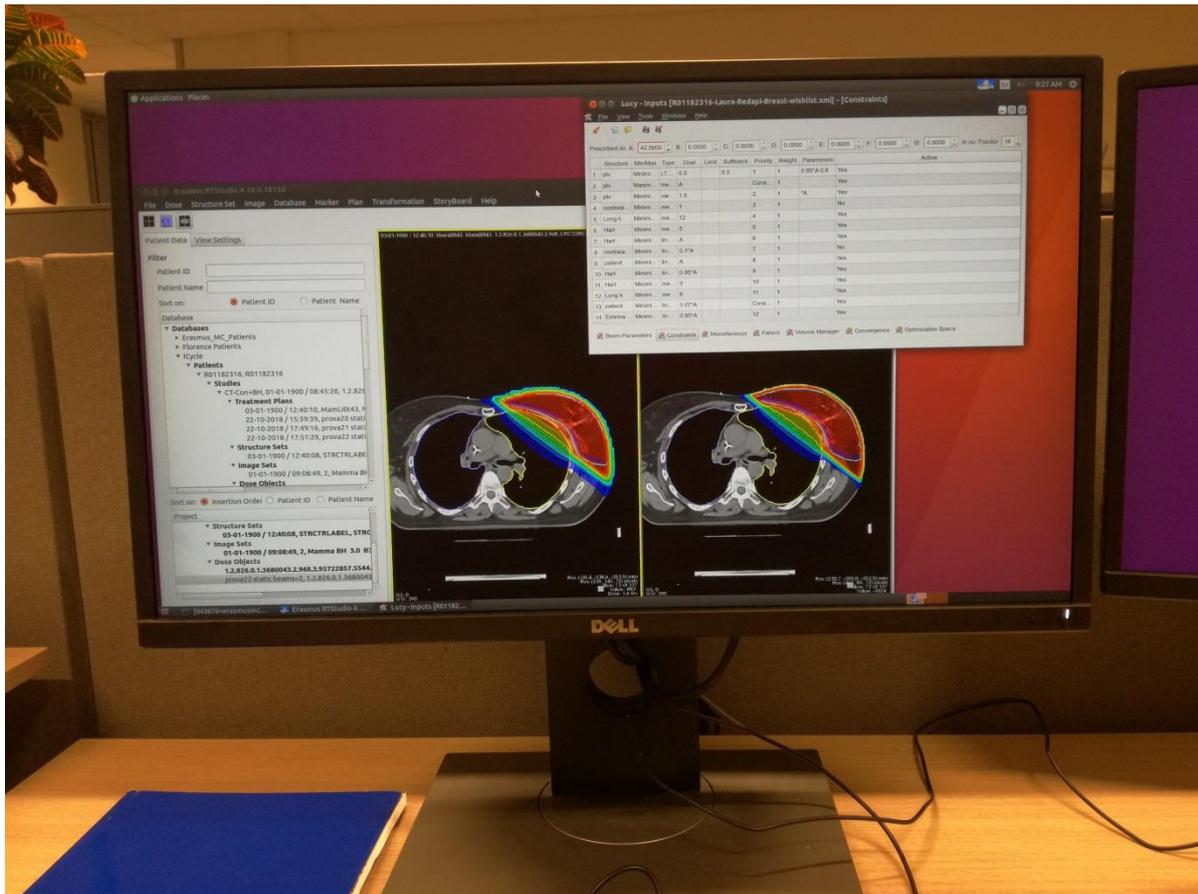
It were very useful spent few weeks in a high level European Institute working in the field of Radiotherapy and learn the background and application of advanced system for automated plan generation, developed in Rotterdam.

Two weeks are needed only to start to learn how the iCycle software works and to investigate possibilities to develop automated techniques for breast treatment planning. Back in Florence, there will be a possibility to continue the research via remote access to iCycle installed in Rotterdam because the University of Florence Radiotherapy group (medical physicists and radiation oncologists) is interested to test the same system to optimize the quality of breast treatments also for our protocol. Coming back in Florence, I can share my expertise with the other medical physicists and I am carrying on this project that I will present as my dissertation for the Medical Physics specialization school(Florence).