**Title:** Feedback on use of the RapidPlan ™ knowledge based planning system for the realization of prostatic treatment planning in volumetric modulated arctherapy

**Authors:**

V. Bodez (1), C. Khamphan (1), G. Francois (1), E. Jaegle (1), M. E. Alayrach (1), A.Badey (1), P.Martinez (1), R. Garcia (1)

1 Institut Sainte Catherine/Avignon/France

**Introduction:** Inverse planning is an interactive and iterative process that depends on the user experience. This process is time consuming and requires compromises between organ at risk (OAR) sparing and target volume coverage. However, the use of a knowledge based planning system could allow harmonization of practices.

**Materials and methods:** RapidPlan™ (Varian) is a mathematical model using existing treatment plans to estimate OARs dose volume histograms and optimization objectives of targets for new plans. The database of the expert system is made with the target volumes and OARs structures, dose prescription and beams arrangement of treatment plan compliant to dosimetric criteria.

One year after the introduction of a thesaurus allowing a homogenization in planning practices, a first model composed with 36 patients treated for prostate cancer and seminal vesicles (P+VS) with a dose of 80Gy in 40 fractions was created. For 125 patients, treatment plans performed with and without the RapidPlan™ system were compared.

A second model, extended to 116 patients, was then created on the basis of the first one, including treatment plans with OARs corresponding to a wider range in terms of volumes and also cases with hip prostheses. These prostheses are considered and delineated as normal femoral heads. Optimization objectives and constraints have also been refined in this model.

**Results:** With the 36 patient model, 60% of the treatment plans obtained met the current criteria for P+VS localization as early as the first optimization. 45 patients were treated using this model.

With the model extended to 116 patients, 119 patients were treated and among them 9 had single or double hip prostheses. 83.2% of treatment plans were acceptable with only one inverse optimization. Among the 20 cases requiring at least one additional optimization, 7 were due to the presence of hip prostheses (2 single and 5 double, or 5.9%), 4 to poor coverage of CTV Prostate (3.4%), 4 to an excess dose delivered to 2% of the rectum (3.4%), 3 to a low bladder filling (2.5%), 1 to an excess dose delivered to 50% of the rectum (0.8%), and 1 to the presence of a femoral cyst (0.8%).

**Conclusion:** The RapidPlan™ knowledge based planning system allows homogenization of practices in inverse planning. It increased efficiency with direct access to the result and improved treatment plan quality. RapidPlan™ also opens up an opportunity for knowledge transfer through model transfer.

**Keywords :** RapidPlan™ ; knowledge based planning system ; inverse planning ; radiotherapy