

## Direct Step & Shoot: a New Module for Prostate Cancer IMRT

M Treutwein, M Hipp, L Bogner University Medical Center, REGENSBURG, Germany

## Aims & Objectives

The aim of this treatment planning study is to compare the techniques of 3D conformal radiotherapy (3DCRT) and IMRT to determine the feasible advantages for prostate cancer patients using a new direct step & shoot (DSS) IMRT module.

For the optimisation of the IMRT, Nucletron offers as a part of the optimising process their IM-optimisation software or their new module DSS. The earlier IM-optimisation software searches first for the ideal fluence for each beam, and this is then followed by the segmentation. The new DSS module integrates the segmentation into the optimisation process. After that both continue with the final dose calculation.



Both IMRT optimisation schemes reduced the doses received by the OARs when compared to the 3DCRT plan. Using the Nucletron IMoptimisation software the first weighting scheme of the objectives resulted in satisfactory dose-volume histograms (DVHs) for the

OARs, and an obviously 'softened' DVH for the PTV (when compared to the 3DCRT plan). The DSS optimisation produced a steeper DVH for the PTV, but worse results for the OARs when

Scheme 2 improved the DVHs for the OARs using the DSS process,

to about the same level as the IM-optimisation with scheme 1, the

PTV DVH staying nearly unchanged. The IM-optimisation produced

the worst DVH for the PTV of the five different plans we considered.

In Figure 1 the DVHs are shown of a characteristic 3DCRT plan, the

IM plan (Scheme 1) and the DSS plan (Scheme 2). Table 2 presents the mean values, averaged over the four patients, for the PTV and

Table1: Dose-volume objective schemes

Results

compared to the IM-optimisation.

for the two OARs

## **Materials & Methods**

Between March 2006 and November 2006, four patients with a mean age of 71 years were enrolled for primary EBRT for localised prostate cancer. Three of these patients received antiandrogen therapy either before or during radiotherapy. All four patients had 3D CT treatment planning with a slice thickness of 5 mm and with immobilisation in a vacuum mattress (BlueBAG BodyFIX, Medical Intelligence).

As an initial step, it was planned (using Oncentra MasterPlan) to deliver 60 Gy to the planning target volume (PTV), calculated using data for a Siemens Primus linear accelerator (15 MV photons, with multileaf collimator leaf width of 1cm at the isocentre). The preselected gantry angles were 25°, 90°, 120°, 240°, 270° and 335°. The rectal volume and urinary bladder were delineated as organs at risk (OARs). Additional structures were also contoured in order to help (we term them 'Help Contours') avoid hot spots in normal tissues surrounding the PTV to a distance of 1cm. The dose-volume objectives were defined by two schemes (Table 1). After optimisation the plans were re-normalised to the average of PTV, giving 30 fractions with a fractional dose of 2 Gy. The 3DCRT plan used identical gantry angles with the beams weighted by experience.

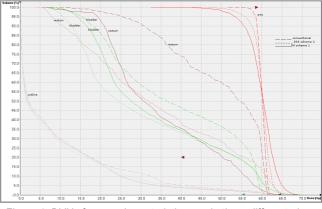


Figure 1: DVHs for one characteristic case in three different plans

## Conclusions

In every case the DSS optimisation resulted in a steeper DVH for the PTV than found using the IM process. The DVHs for the OARs are worse with scheme 1 but improve to about the same level with scheme 2. The patients benefit from IMRT by reduced doses to the OARs, keeping a very steep DVH for the PTV with the DSS optimisation.

	mean in PTV [Gy]	mean in bladder [Gy]	mean in rectum [Gy]
3D conmformal	60,3	33,8	41,1
IM scheme 1	60,2	29,6	30,7
DSS scheme 1	60,1	30,3	33,4
IM scheme 2	60,3	28,2	28,5
DSS scheme 2	60.2	28.0	20.8

Table2: Mean dose values in different regions, averaged over five plans

Email for correspondence: marius.treutwein@klinik.uni-regensburg.de