brachytherapy across a range of clinical applications.

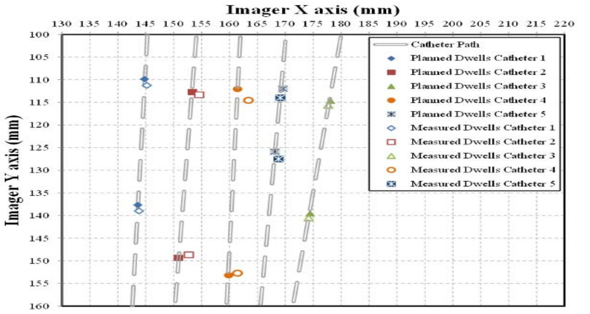

Figure 1: Measurement vs plan for 2 dwells in each of 5 catheters from a patient treatment fraction. A subset of all measurements is shown.

Poster Discussion: Brachytherapy: Clinical and physics

PD-0178

Parameterised rectal dose and associations with late-toxicity in high-dose-rate prostate brachytherapy

L. Hamlett[1], D.A. Wood[1], A. Aitkenhead[1], C. Hodgson[2], J. Wylie[3], A. Choudhury[3], J. Logue[3]

[1]*The Christie NHS Foundation Trust, Radiotherapy Physics, Manchester, United Kingdom*

[2]*The Christie NHS Foundation Trust, Statistics, Manchester, United Kingdom*

[3]*The Christie NHS Foundation Trust, Clinical Oncology, Manchester, United Kingdom*

Purpose/Objective: In high dose rate (HDR) brachytherapy of the prostate, radioactive dwell positions are delivered by a single source inserted via needle catheters into the target volume. The rectal mucosa also recieves dose during the treatment, which may lead to toxicity effects. An in house Matlab programme was utilised to parameterise the rectal dose allowing for association with patient reported late toxicity.

Materials and Methods: During treatment of a series of 76 patients, using ultrasound imaging to localise the anatomy and catheter locations. The target volumes and OAR were contoured on the ultrasound scan.The anterior rectal mucosal wall weas identified by contouring the transrectal ultrasound balloon. Source positions and dwell times, along with the dose delivered to the patient were computed using the Oncentra Prostate treatment planning system (TPS). Data for the series of patients were exported from the TPS in DICOM format, and a series of parameterisation methods were developed in a Matlab environment to assess the rectal dose, as shown in figure 1.

The change in mean LENT SOMA bowel score was calculated for each patient for several post-treatment time points over a 5 year period, using pre-treatment score as baseline. Association between change in mean score and radiation dose to the rectum was the examined using spider plots.

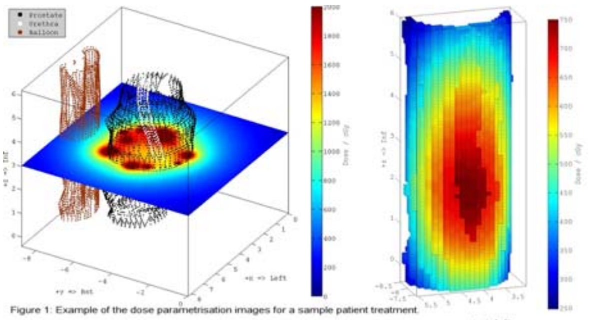

Figure 1: Example of the dose parametrisation images for a sample patient treatment.

(a) The planned dose and structures, as exported from the TPS. (b) The dose delievered to the 3D surface of the anterior rectal mucosa

Results: Contours of the anterior rectal mucosa were voxelised witthin Matlab to allow the dose to the rectal mucosa to be analysed directly from the 3D dose grid. Dose parameterisations based on dose-surface(DSH) and dose line (DLH) histograms were obtained. Parameters for both lateral and longitudinal extents of the mucosal dose were produced using dose-line histograms in the relevant directions. The results of the spider plots indicated 3 patients with the largest increases in mean LENT SOMA score (1.7, 1.7, 1.4) compared to pre treatment, had recieved higher doses of radiation to the rectum (50th percentile dose volumes 438, 455, 519cGy respectively) than the majority of the patient sample. For these 3 the most severe side-effects were seen at 6 months.

Doses ranged from 250 to 588cGy for the remaining 69 patients. For these patients increases in mean LENT SOMA score were 1 or less even though a number of them had recieved similar radiation doses to the rectum as the 3 patients described above.

Conclusions: We have using Matlab found a number of parameters to aid in quantifying the dose to the rectal mucosa during HDR proate brachytherapy. the geometry of the transrectal probe standardises the rectal anatomy, making this treatment technique particularly suited to studies of this nature. The results of the analysis showed some small associations between dose and late reported toxicities; this is to be further studied using prospective data and considering other OAR.

PD-0179

An automated optimization tool for HDR prostate brachytherapy with divergent needles

M. Borot de Battisti[1], M. Maenhout[1], B. Denis de Senneville[2], G. Hautvast[3], D. Binnekamp[3], J.J.W. Lagendijk[1], M. Van Vulpen[1], M.A. Moerland[1]

[1]*UMC Utrecht, Department of Radiotherapy, Utrecht, The Netherlands*

[2]*IMB UMR 5251 CNRS/University of Bordeaux, Mathematics, Bordeaux, France*

[3]*Philips Group Innovation, Biomedical Systems, Eindhoven, The Netherlands*

Purpose/Objective: The objective is the development of a fully automatic inverse dose planning optimization tool for MRI guided focal HDR prostate brachytherapy with divergent needles. The optimizer is tested in a planning study by assessing the dose volume parameters.

Materials and Methods: To develop a fully automatic optimizer for a given number of divergent needles (Figure 1a), the following parameters need to be optimized: (1) the position of the center of rotation (2) the angles of the needle and (3) the dwell times of the sources. The idea of our optimization workflow is to get the most benefit of the linear properties of the dwell times regarding the dose. The center