EP-1504

Stability of gold marker position during IGRT of prostate cancer

S. Kuechler[1], M. Gainey[1], A.L. Grosu[1]
[1]*Universitätsklinik Freiburg, Klinik für Strahlenheilkunde, Freiburg, Germany*

Purpose/Objective: The aim of this study is to assess the stability of relative gold marker position due to deformation and marker migration for prostate cancer during the treatment course of image-guided VMAT external beam radiotherapy.

Materials and Methods: 30 patients with localized prostate cancer, who underwent primary IGRT with implanted gold markers (MPB Marker Kit 1.2x3mm, MPB Scherer Medizinprodukte GmbH, A-Krustetten), were chosen for this study. 27 patients had four and three patients had three implanted markers. The gold marker implantation was carried out one week before the planning CT. The IGRT was carried out with kV-CBCT and orthogonal kV-Imaging (OBI Varian Medical Systems, Palo Alto CA). For this study 739 orthogonal kV-image pairs were evaluated: between 9 and 32 kV image pairs were evaluated per patient. The images were segmented with an edge algorithm (MATLAB R2013a, MathWorks). The centroid of the gold marker was identified to evaluate the gold marker position. The inter-marker distances were determined and compared to those identified in the planning CT.

Results: The median marker distance was 23.9 ± 9.7 mm (SD). The marker distance varied from 5.5 to 45.7 mm. For 21 patients the marker distance variations remained under 3 mm. For five patients marker distance variations between 3 and 4 mm were identified. The variation exceeded 4 mm for four patients. For one of them the variation seemed to be the result of either prostate deformation related to organ filling in the planning CT or gold marker migration after the planning CT. In this case the mean distance variation between two markers was 5.7 ± 0.5mm (SD). Overall 640 of 739 IGRT sessions showed deviations in marker distance variation below 3 mm. 67 distance variations were between 3 and 4 mm. In 32 IGRT sessions the inter-marker distance exceeded 4 mm.

Conclusions: In most cases the gold marker distance variation seems to be smaller than 3 mm, so that a good image matching can be achieved. If the variation exceeds 3 mm the matching might become more difficult.

For patients with larger variation it should be determined if the change is the result of gold marker migration. Furthermore, if necessary, a new planning CT should be performed and the PTV margins appropriately adapted.

EP-1505

Assessment of migration of intraprostatic fiducial markers during radiotherapy

G. Mantello[1], B. Vagnoni[1], F. Fenu[1], F. Cucciarelli[1], S. Costantini[1], M. Scricciolo[1], L. Vicenzi[1], M. Valenti[2], S. Maggi[2], M. Cardinali[1]
[1]*Azienda Ospedaliero Universitaria Ospedali Riuniti, Radiotherapy Department, Ancona, Italy*
[2]*Azienda Ospedaliero Universitaria Ospedali Riuniti, Physic Department, Ancona, Italy*

Purpose/Objective: The use of fiducials markers (FM) as surrogate for prostate position in IGRT modality requires a stable markers position within the gland.

Aim of this study was to assess the marker migration during the full course of prostate radiotherapy.

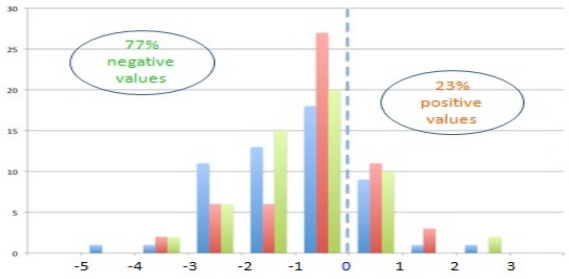
Materials and Methods: The analysis was performed on 55 low risk cT1-2 prostate cancer patients, treated with Image Guided Radiotherapy between June 2009 and May 2014. Three markers per patient were implanted at the base (A), middle (B) and apex (C) of the gland. All patients underwent computed tomography (CT sim) 1-mm thickness, ≥1 week after implantation; a daily CBCT was used to check markers position before each treatment session . Retrospectively CT sim and CBCTs acquired at 1st , 10th , 20th , 30th and 39th fraction were used to record FM coordinates (x,y,z). The distances between markers (FMD) as AB, BC, CA were measured as:

$$X_1X_2=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2+(z_1-z_2)^2}$$

FMDs variations during the full course of radiotherapy were then calculated as the differences between CBCTs and CTs data.

Results: The average absolute variation of all FMDs was 1,20±0,67 mm. The largest observed variation in FMD was 8,96 mm. 94% of recorded variations were 3 mm or less , while 80% 2 mm or less. A simultaneous progressive reduction of FMDs was seen in 77% of patients and it was related to the shrinking of the prostate volume during the treatment (Fig 1). No correlation was found between FMD variations and initial prostate volume. Smaller variations were recorded in patients with at least 10 days gap between markers implantation and CT acquisition due to the edema reduction.

Figure 1: Distribution of FMD variations



Conclusions: The obtained results indicates small variations in the relative position of the markers (1,20±0,67 mm) without a significant marker migration.

EP-1506

Evaluation of cranial setup accuracy: a double shell positioning system versus an in-house 3-point mask solution

S. Van der Meer[1], N. Menten[1], L. Verheesen[1], J.J. Jager[1], J.D. Zindler[1], D.B.P. Eekers[1], G. Bosmans[1], L.H.P. Murrer[1]
[1]*MAASTRO Clinic, GROW University Medical Centre Maastricht (Department of Radiation Oncology), Maastricht, The Netherlands*