PO-1100

Quality assurance of volumetric modulated arc therapy for a prostate cancer patient with a hip prosthesis

T. Ikeda[1], H. Moriwaki[1], A. Sakumi[2]
[1]*Mitsui Memorial Hospital, Radiology, Tokyo, Japan*
[2]*The Univercity of Tokyo, Radiology, Tokyo, Japan*

Purpose/Objective: We have investigated the impact of an implanted metal prosthesis on dose distributions in VMAT by using a QA water phantom including a metal cylinder.

Materials and Methods: In order to evaluate the influence of the implanted metal prosthesis, we placed a 30 mm thick brass cylinder in the QA water phantom. Two plans were created: 1) VMAT with split arc segments thereby avoiding direct beam deliveries to the prosthesis and femur (hereinafter referred to as avoidance VMAT), and 2) a single arc VMAT. We measured the isocenter dose by a Farmer-type ion detector and an axial dose distribution using radiochromic films with/without the brass cylinder.

Results: The isocenter dose difference with or without the metal cylinder for each of the avoidance VMAT was negligibly small. However, a significant dose difference was observed for a normal single arc VMAT. Meanwhile, the difference of the dose distributions with or without the metal for the avoidance VMAT was insignificant. It was further observed that the avoidance VMAT led to insignificant dose differences in high dose areas such as prostate target, whereas the area close to the metal showed large dose differences possibly due to back scattering from the metal target.

Table isocenter dose in each plan.

	Plan Dose (phantom)	With a metal cylinder	% difference	Without a metal cylinder	% difference
avoidance VMAT	187.6	190.7	1.6%	190.7	1.6%
single arc VMAT	187.9	184.3	1.9%	189.4	0.8%

Conclusions: We observed a significant impact of a metal object on dose distributions in VMAT when a single full arc beam was delivered. However VMAT beams with the avoidance angles did not suffer from the metal effect . This result encourages us to use a water phantom without a metal object for QA of a prostate cancer patient with a hip prosthesis.

PO-1101

Doses in the bladder and rectum during radiotherapy for prostate cancer, depending on the technique and the margin

A. Ryczkowski[1], S. Nachyla[2], M. Skorska[1], T. Piotrowski[2]
[1]*Greater Poland Cancer Centre, Department of Medical Physics, Poznan, Poland*
[2]*University of Medical Sciences, Department of Electroradiology, Poznan, Poland*

Purpose/Objective: The purpose of this paper is to present the differences in the doses received by critical organs (bladder, rectum) during radiotherapy of prostate cancer limited to the organ, depending on the size of irradiation technology and CTV-PTV margin conditioned by an image verification method.

Materials and Methods: The study was conducted on a group of 20 patients who were treated with radiotherapy between 2012 and 2013. For each patient 20 alternative treatment plans were prepared. Plans differ from each other by method of irradiation and the size of the CTV-PTV margin. These were respectively: (i) the irradiation method - 3DCRT (3 beams, 20 MV); IMRT (5 beams, 20 MV); IMRT (7 beams, 6 MV); VMAT (2 arcs, 6 MV) and (ii) margins (M) expressed in [mm] and calculated for directions LR / CC / AP - M1 (2/3/4); M2 (3/4/5); M3 (6/5/6); M4 (7/6/6); M5 (8/7/7). The proposed margins are determined by the image verification method (Piotrowski et. Al., Technol Cancer Res Treat, 2014) and correspond respectively: M1 - daily CBCT verification; M2 - CBCT verification during the first five fractions and verification of 2D-kV for the remaining fractions; M3 - CBCT verification during the first five fractions; M4 - 2D-kV verification during the first five fractions; M5 - no image verification, positioning based on the marks on the skin of the patient. Analysis on the average dose in the bladder and rectum, depending on the size of irradiation technology and CTV-PTV margin was conducted For statistical analysis, Friedman ANOVA test was used. Doses are presented in percentage and normalized to total dose (74Gy = 100%). The analysis was performed at the level of statistical significance equal to 0.05.

Results: For both bladder and rectum average doses obtained for 3DCRT were significantly different from the dose for dynamic techniques (IMRT, VMAT) ($p<0.01$). The average difference between the bladder doses for 3DCRT and the dynamic techniques was 15%, for rectum difference was 7%. No statistically significant differences between the average doses for dynamic techniques ($p>0.2$) were found. Analysis of the average doses with respect to used margin showed that there were no statistically significant differences between the doses obtained for the margins M1 and M2 ($p>0.4$ for bladder and $p>0.09$ for rectum). Similar observations were obtained for doses on M3, M4 and M5 ($p> 0.3$ for bladder and rectum). However, the differences between doses for M1, M2 and M3, M4 , M5 are statistically significant ($p<0.01$ for the bladder and $p<0.03$ for the rectum), averaging 10% of the bladder and 5% for rectum.