Feasibility planning study for hypofractionated salvage prostate bed radiotherapy

Koopman, L.; Van der Neut, S.; Roos, C.; Hammer, C.; Vanhauten, H.; Bijmolt, S.; Van den Bergh, A.; Lagendijk, J.; Both, S.; Brouwer, C.

Published in:
Radiotherapy and Oncology

DOI:
10.1016/S0167-8140(19)32606-4

After seeking for the size of the removed sample in the patients during surgery and obtained seroma volume changes on a weekly basis. On the Basis of acquired volume, it was compared with age, term from start of the first treatment after surgery, BMI (body mass index) and the extracted sample size during surgery. And using the ViewRay MRIdian RTP System, the figure was analyzed by PTV(=seroma volume + margin) to obtain a specific volume of the Partial breast radiation therapy.

Results

The changes of seroma volume from MR simulation to the first treatment (a week) is 0~5% in 8, 5~10% in 3, 10 to 15% in 2, and 20% or more in 5 people. Two patients (A, B patient) among subjects showed the biggest change. The A patient's 100% of the prescribed dose volume is 213.08 cc, PTV is 181.93 cc, seroma volume is 15.3 cc in initial plan. However, while seroma volume decreased 65.36% to 5.3 cc, 100% of the prescribed dose volume was reduced to 3.4% to 102.43 cc and PTV also did 43.6% to 102.54 cc. [Fig. 1]
In the case of the B patient, seroma volume decreased 42.57% from 20.2 cc to 11.6 cc. Because of that, 100% of the prescribed dose volume decreased 8.1% and PTV also did to 40% [Table 1]

Conclusion

As the period between the first therapy and surgery is shorter,
the patient is elder and the size of sample is smaller than 100 cc, the change grow bigger.
It is desirable to establish an adaptive plan according to each patient's changes of seroma volume through continuous observation. Because partial breast patients is more sensitive than WBRT patients about dose conformity in accordance with the volume change.

EP-2186 Feasibility planning study for hypofractionated salvage prostate bed radiotherapy

L. Koopman[1], S. Van der Neut[1], C. Roos[1], C. Hammer[1], H. Vanhauten[1], S. Bijmolt[1], A. Van den Bergh[1], J. Lagendijk[1], S. Both[1], C. Brouwer[1], S. Al-Uwini[1]
[1]*UMCG University Medical Center Groningen, Radiotherapie, Groningen, The Netherlands*

Purpose or Objective

Salvage radiotherapy treatment (SRT) can provide long-term disease control for recurrent prostate cancer patients after radical prostatectomy. Introducing hypofrationation will decrease the overall treatment time and may improve effectiveness of radiotherapy. The aim of this study was to evaluate the feasibility of target coverage and organ at risk (OAR) constraints of our proposed hypofractionated regimen as an experimental arm of a phase III randomized controlled trial.

Material and Methods

Planning CT-scans of 5 representative patients who received standard conventional SRT of 35 fractions of 2 Gy were used to virtually create hypofractionated (HF) (20x3Gy) and standard fractionated (SF) (35x2Gy) SRT plans. For both treatment regimens a predetermined list of OAR constraints (Table 1) was tested for its feasibility. Target coverage was evaluated on PTV coverage (D95%).

Table 1: OAR constraints for hypofractionated- and standard regimen

	Hypofractionated Regimen	Standard Regimen
Rectum Dmax	< 100 % PD	< 100 % PD
Rectum D 2 cc	< 100 % PD	< 100 % PD
Rectum < 5%	V60	V70
Rectum < 15%	V55	V65
Rectall Wall < 80%	V25	V30
Rectall Wall < 50%	V38	V41
Rectall Wall < 25 %	V50	V60
Rectall Wall Dmean	< 25 Gy	< 30 Gy
Anal Canal Dmean	< 24 Gy	< 25 Gy
Anal Wall < 35%	V25	V30
Bladder Dmax	< 102 % PD	< 102 % PD
Bladder < 50%	V50	V60
Bladder < 25%	V60	V70
Femoral Head < 10%	V45	V55

Results

The average D95% of the low dose PTV (LD PTV) was 99,3% for the standard regimen and 99,5% for the hypofractionated regimen. For the high dose PTV (HD PTV) the average D95% for the standard regimen was 98,6% and 99,2% for the hypofractionated regimen. In only one case 50% of the constraints was not met for both HF and SF regimen. In two cases, all constraints were met for the hypofractionated regimen, while the constraints for rectum Dmax and bladder Dmax where not met for the standard regimen. In one of these two cases, the rectum V65 was not met neither for the standard regimen. For the other 2 cases, only the rectum volume receiving 55 Gy for HF and 65 Gy for SF was more than the intended 15%, with an average of 18,2% of the rectum volume receiving 55 Gy for the HF regimen versus 17,2% of the rectum volume receiving 65Gy for the SF. The median rectum volume (70 cc, range 62-119) did not influence the probability to meet rectum constraints.

Conclusion

For both target coverage and OAR constraints the hypofractionated regimen appears feasible except for one constraint (rectum V55) which needs further research. A larger number of patients is needed to confirm this feasibility.

EP-2187 Metal artifact correction improves dose calculation of intensity modulated radiation therapy

H. Moriwaki[1], T. Ikeda[1], T. Kiyomiya[1], H. Tajima[1], K. Shiraishi[1], A. Sakumi[2]
[1]*Mitsui Memorial Hospital, Radiation oncology, Tokyo, Japan;* [2]*NTT medical center Tokyo, Department of Radiology, Tokyo, Japan*

Purpose or Objective

We evaluated the dose errors of Intensity Modulated Radiation Therapy (IMRT) between the calculated dose from the planning CT with a commercial CT metal artifact reduction algorithm and the measured dose by ion chamber and radio-chromic film in a water phantom with a cylinder of Titanium alloy

Material and Methods

A prostate cancer patient with a unilateral right hip prosthesis was selected for this study. IMRT plans were created by Pinnacle3 (Philips Ltd.) v.9.10 using Synergy MLCi (Elekta Ltd.) beam models. We compared among three plans: 1) Five beams step and shoot IMRT plan, 2). Volumatic Modulated Arc Therapy (VMAT) plans with split arc segments thereby avoiding direct beam deliveries to the prosthesis (hereinafter referred to as avoidance VMAT), and 3) a single full-arc beam.
A Titanium alloy (Ti-6Al-4V, density = 4.43 g/cm^3) cylinder object with a diameter of 30 mm was placed in a water phantom imitating right femoral position. CT images were taken with a single energy metal artifact reduction (SEMAR) algorism, installed on the CT system (Aquilion ONE, Canon Medical Corporation). The patient treatment