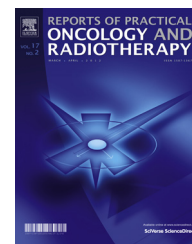




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Original research article

Volumetric image-guided highly conformal radiotherapy of the prostate bed: Toxicity analysis



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ABSTRACT

Aim: To evaluate toxicity of high conformal image-guided radiotherapy of the prostate bed.

Background: Radiotherapy of the prostate bed has a pivotal role in the post-operative and salvage settings, but few clinical data are available on the use of daily image guidance in combination with highly conformal techniques, and data on long-term results are lacking.

Materials and methods: We analyzed 118 patients irradiated on the prostate bed using conformal plans processed with a micro-multileaf collimator, and daily checking treatment set-up with a cone-beam CT system. Correlation between toxicity and clinical-dosimetric parameters was assessed by the Cox regression model and log-rank test. Survival analyses were performed with the Kaplan–Meier method.

Results: Median follow-up was 54.08 months. Late grade ≥ 2 gastro-intestinal (GI) and genitourinary (GU) toxicity were 3.4% and 4.2%, respectively. Actuarial 4-year late grade ≥ 2 GI and GU toxicities were 4% and 6%, respectively. Four-year relapse-free survival was 87%. At log-rank test, acute grade ≥ 2 GI toxicity is associated with the use of antihypertensives ($p = 0.03$), and there is a trend toward significance between the use of anticoagulants and late grade ≥ 2 GI toxicity ($p = 0.07$). At Cox analysis, acute grade ≥ 2 GU toxicity is correlated with the percentage of bladder volume receiving more than 65 Gy ($p = 0.02$, HR 1.87 CI 1.25–2.8), and the maximal dose to the rectum is correlated to the development of late grade ≥ 2 GI toxicity ($p = 0.03$, HR 2.75 CI 1.10–6.9).

Conclusions: Conformal volumetric image-guided radiotherapy of the prostate bed leads to low toxicity rates.

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1. Background

Radiotherapy of the prostate bed improves biochemical control in patients with adverse pathological features after radical prostatectomy,^{1,2} increases overall survival and reduces the risk of metastasis.³ Several studies investigated acute and long-term toxicity after post-prostatectomy radiotherapy,^{4–6} but few clinical data are available on the use of daily image guidance and of highly conformal techniques, such as intensity modulated radiotherapy (IMRT).^{7–10}

2. Aim

In the current study we evaluated acute and late toxicity, and analyzed the impact of patient characteristics and rectal and

bladder dose-volume parameters on the development of toxicity after highly conformal image-guided radiotherapy.

3. Materials and methods

From August 2007 to May 2015, 118 patients underwent adjuvant or salvage 3-dimensional conformal image-guided radiotherapy (IGRT) using an on-board cone beam computed tomography (CBCT) system, after radical prostatectomy (RP). Table 1 summarizes the clinical features of this patient population. With a median time of 6.45 months (range, 1.93–11.86) from RP, adjuvant radiotherapy was administered in 80 (67.8%) patients because of positive margins, seminal vesicle invasion, or extraprostatic extension (pT3). Thirty-eight patients (32.2%) received salvage radiotherapy for a rising PSA after RP, with

Table 1 – Patient characteristics (a), and co-morbidities status (b) (118 patients).

	Mean	Median	Range		No. of patients
<i>(a) Patient characteristics</i>					
Age (years)	66.5	67	51–79		
PSA (ng/ml) before RP	13.57	9	1.9–120		
Pathological stage				T2a	6
				T2b	7
				T2c	24
				T3a	43
				T3b	37
				T4	1
Surgical margins				Positive	52
				Negative	66
Gleason score				6	21
				7 (3+4)	31
				7 (4+3)	30
				8	25
				9	11
PSA (ng/ml) before EBRT	0.86	0.16	0–19.7		
Treatment setting				Post-operative	80
				Salvage	38
Pre-EBRT urinary symptoms ^a				Yes	33
				No	85
Androgen deprivation therapy				Yes	46
				No	72
<i>(b) Co-morbidities status</i>					
Diabetes				Yes	9
				No	109
Colitis				Yes	2
				No	116
Smoking abitude				Yes	48
				No	70
Abdominal surgery				Yes	47
				No	71
Antihypertensive medication				Yes	46
				No	72
Anticoagulants				Yes	22
				No	96

Abbreviations: RP = radical prostatectomy; EBRT = external beam radiation therapy.

^a Stress incontinence.

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