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High-dose-rate brachytherapy for localized prostate adenocarcinoma post abdominoperineal resection of the rectum and pelvic irradiation: Technique and experience

Siavash Jabbari[1], I.-Chow Hsu[1], Jun Kawakami[2], Vivian K. Weinberg[3], Joycelyn L. Speight[1,2], Alexander R. Gottschalk[1], Mack Roach III[1,2], Katsuto Shinohara[2,*]

[1]*Department of Radiation Oncology, University of California San Francisco, San Francisco, CA*
[2]*Department of Urology, University of California San Francisco, San Francisco, CA*
[3]*Department of Biostatistics, University of California San Francisco, San Francisco, CA*

ABSTRACT

PURPOSE: Treatment options are limited for patients with localized prostate cancer and a prior history of abdominoperineal resection (APR) and pelvic irradiation. We have previously reported on the successful utility of high-dose-rate (HDR) brachytherapy salvage for prostate cancer failing definitive external beam radiation therapy (EBRT). In this report, we describe our technique and early experience with definitive HDR brachytherapy in patients post APR and pelvic EBRT.

PATIENTS AND METHODS: Six men with newly diagnosed localized prostate cancer had a prior history of APR and pelvic EBRT. Sixteen to 18 HDR catheters were placed transperineally under transperineal ultrasound–guidance. The critical first two catheters were placed freehand posterior to the inferior rami on both sides of the bulbar urethra under cystoscopic visualization. A template was used for subsequent catheter placement. Using CT-based planning, 5 men received 36 Gy in six fractions as monotherapy. One patient initially treated with EBRT to 30 Gy, received 24 Gy in four fractions.

RESULTS: Median age was 67.5 (56–74) years. At a median followup of 26 (14–60) months, all patients are alive and with no evidence of disease per the Phoenix definition of biochemical failure, with a median prostate-specific antigen nadir of 0.19 ng/mL. Three men have reported grade 2 late genitourinary toxicity. There has been no report of grade 3–5 toxicity.

CONCLUSION: Transperineal ultrasound–guided HDR brachytherapy using the above technique should be considered as definitive therapy for patients with localized prostate cancer and a prior history of APR and pelvic EBRT.

Keywords: Prostate cancer; Brachytherapy; High-dose-rate; Abdominoperineal resection; HDR

Introduction

It is estimated that 79,130 men were diagnosed with colorectal cancer in the United States in 2007 (1), with adenocarcinoma of the prostate posing a 17% lifetime risk (1). Thus, a significant number of men diagnosed with colorectal cancer remain at risk for the development of a second primary cancer of the prostate. Evidence suggests that men diagnosed with colorectal cancer may be at a higher risk of developing prostate cancer than any other malignancy, with nearly twice the relative risk of the general population (2). Furthermore, approximately 4.5% of pelvic nodal dissections for rectal cancer contain metastatic carcinoma of the prostate, leading to a diagnosis of occult synchronous prostate malignancy (3).

The current standard of care for rectal adenocarcinoma consists of surgical interventions, such as abdominoperineal resection (APR) and adjuvant or neoadjuvant chemotherapy concurrent with pelvic irradiation (1, 4). Despite the inaccessibility of the prostate gland for physical examination after APR, wide-spread biochemical screening and alternative

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* Corresponding author. Department of Urology, University of California San Francisco, 1600 Divisadero Avenue, MZ Bldg A, Room A-643, San Francisco, CA 94115. Tel.: +1-415-353-7101; fax: +1-415-353-7443.

E-mail address: KShinohara@urology.ucsf.edu (K. Shinohara).

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techniques for prostate biopsy allow for the detection of subsequent prostate cancers. Although the lack of rectal access can pose a challenge in the evaluation of the prostate gland, our previously described method for transperineal ultrasound–guided prostate biopsy in post-APR patients allows tissue diagnosis in this setting (5). With a prior history of pelvic surgery and irradiation, however, definitive treatment options for a newly diagnosed prostate cancer are limited. Traditional treatment strategies of permanent prostate seed implant (PPI) or cryotherapy are precluded in patients without a rectum, and a curative dose of external beam radiation therapy (EBRT) is contraindicated in the setting of prior pelvic irradiation. Prostatectomy in this population has also been associated with high rates of surgical failure and morbidity (6), and active surveillance is similarly impractical given the lack of rectal access for physical examination, reliable imaging, and followup biopsies. In the present study, we describe our technique and early experience with transperineal ultrasound–guided high-dose-rate (HDR) brachytherapy in the definitive treatment of localized prostate cancer in the setting of prior APR and pelvic irradiation.

Patients and methods

Patient and treatment characteristics

Over 250 patients with prostate cancer have been treated with HDR brachytherapy at the University of California San Francisco (UCSF) since 1997, of whom 6 had a prior history of APR and pelvic irradiation. Table 1 illustrates pertinent patient and treatment characteristics for this cohort. Five patients had a previous history of APR and EBRT to a dose of 21–45 Gy for rectal cancer, and 1 was previously treated with APR for ulcerative colitis and subsequently with EBRT to a total dose of 73.80 Gy for localized prostate cancer, which recurred 5 years later (patient E). This local recurrence was definitively treated by transperineal ultrasound–guided HDR brachytherapy given the history of APR and pelvic EBRT. All 6 patients were diagnosed with their HDR-treated new or recurrent prostate cancer between 1999 and 2007, and were initially screened by prostate-specific antigen (PSA) surveillance. Imaging, including pelvic CT and bone scan, excluded metastatic disease in high-risk patients. At least 5 years had elapsed since completion of APR and pelvic EBRT before biopsy of the prostate gland, performed via a transperineal ultrasound–guided approach (5). All cores taken from the prostate on biopsy returned as prostatic tissue. However, seminal vesicle biopsy was difficult to accomplish via this visualization technique. One patient received 3 months of neoadjuvant androgen deprivation therapy (ADT) (patient A), and another received the same regiment of neoadjuvant ADT followed by 2 years of adjuvant ADT (patient B). Patient A also received 30 Gy of pelvic nodal intensity-modulated radiation therapy before HDR brachytherapy.

Table 1
Patient and treatment characteristics

Patient	A	B	C	D	E	F	Median
Patient characteristics							
Age at HDR brachytherapy	62	67	74	56	72	68	67.5
Previous diagnosis	Colorectal cancer	Colorectal cancer	Colorectal cancer	Colorectal cancer	Ulcerative colitis & prostate cancer	Colorectal cancer	—
Prostate cancer stage	T20M0	T2bN0M0	T2N0M0	T1cN0M0	T1cN0M0	T1cN0M0	—
Pretreatment PSA (ng/mL)	7.6	5.2	9.6	10	2.7	6.16	6.88
Gleason Score	3 + 3	4 + 4	3 + 4	3 + 4	4 + 4	3 + 3	—
Treatment							
Previous pelvic EBRT dose (Gy)	45	45	21	43.5	73.8	45	45
Prescribed HDR dose (Gy)	24	36	36	36	36	36	36
Number of HDR fractions	4	6	6	6	6	6	6
Additional pelvic EBRT dose (Gy) with HDR	30	None	None	None	None	None	—
Duration of ADT (mo)	3	27	None	None	None	None	—
Outcomes							
Duration of followup (mo)	60	47	35	14	17	14	26
Nadir PSA to date	<0.1	<0.1	0.43	0.36	0.01	1.72	0.19
PSA at last followup (ng/mL)	0.1	<0.1	0.74	0.36	0.01	1.95	0.23
HDR-related late toxicity	None	G2 urinary	G2 urinary	G2 urinary	None	None	G1 urinary
Disease status by ASTRO definition	NED	NED	Failed	NED	NED	NED	NED
Disease status by Pheonix definition	NED	NED	NED	NED	NED	NED	NED

HDR = high-dose-rate; G2 = Grade 2; G1 = Grade 1; PSA = prostate-specific antigen; EBRT = external beam radiation therapy; ADT = androgen deprivation therapy; ASTRO = American Society for Therapeutic Radiology and Oncology; NED = no evidence of disease.