

Case Report

## Bladder wall recurrence of prostate cancer after high-dose-rate brachytherapy

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### ABSTRACT

**PURPOSE:** Prostate cancer seeding after needle biopsy has been reported in the perineum, rectal wall, and periprostatic soft tissue. In this article, we report the results of a localized prostate cancer recurrence in the bladder following protrusion of a single high-dose-rate brachytherapy catheter through the bladder wall at the ultimate site of failure.

**METHOD AND MATERIALS:** A 62-year-old man with high-risk prostate adenocarcinoma was treated with long-term androgen deprivation therapy, intensity-modulated radiation, and high-dose-rate brachytherapy boost. He developed biochemical recurrence 4 years after treatment, and a CT scan of the pelvis revealed a nodule in the posterior, inferior bladder wall.

**RESULTS:** Surgical pathology following transurethral resection of tumor within the bladder was consistent with high-grade prostate adenocarcinoma. The patient's prostate-specific antigen level fell to the range of normal postoperatively, and whole body imaging, including a multiparametric MRI of the prostate with diffusion and spectroscopy, failed to reveal any other sites of disease. Review of the CT scan obtained for dosimetry at the time of brachytherapy demonstrated a lone catheter protruding through the bladder wall at the site of eventual recurrence. The tumor recurred in the bladder 12 months later, once more without evidence of disease within the prostate itself or distantly, and the patient was started on salvage androgen deprivation therapy.

**CONCLUSIONS:** This case is the first report of prostate cancer recurrence in the bladder wall after brachytherapy and raises questions about prostate cancer biology, brachytherapy technique, and the timing of brachytherapy boost relative to whole pelvic radiotherapy for prostate cancer. Published by Elsevier Inc. on behalf of American Brachytherapy Society.

### Keywords:

Brachytherapy; Prostate cancer; Tumor seeding; Circulating tumor cells; Androgen deprivation

### Introduction

Transperineal brachytherapy is performed for some prostate cancers as monotherapy or in combination with external beam radiation to treat many intermediate- and high-grade tumors. Brachytherapy technique is heterogeneous and highly physician-dependent. For high-dose-rate (HDR) brachytherapy, many providers advocate bladder wall tenting under cystoscopy to achieve superior dosimetric coverage of the bladder neck (1). Although cancer

recurrence along brachytherapy catheter tracts has not been previously described, the rate of perineal recurrence after biopsy is approximately 1% and has been reported up to 14 years after intervention (2, 3). Several cases of rectal wall recurrence after transrectal ultrasound-guided biopsy have also been published, and much like recurrences within the perineum, these are typically managed with local excision (4–6). In this article, we report a case of prostate cancer recurrence in the bladder wall approximately 4 years after an HDR brachytherapy catheter protruded into the bladder lumen at the same location.

### Case report

In March 2009, a 62-year-old man underwent prostate-specific antigen (PSA) screening and was found to have

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an elevated level of 64.3 ng/mL. Although digital rectal examination was unremarkable, a subsequent transrectal ultrasound-guided biopsy of the prostate demonstrated Gleason grade 4 + 4 prostate adenocarcinoma in 10 of 18 cores with sonographic evidence of extracapsular extension at the apex (uT3a). Specifically, evidence of malignancy was found in the bilateral mid-gland and apices but not the base. His PSA rose to 75.3 ng/mL in May 2009, but there was no evidence of metastatic disease on either a non-contrast CT scan of the abdomen and pelvis or a Tc99m bone scan. For high-risk local disease, he therefore received long-term androgen deprivation therapy and was treated with a course of intensity-modulated radiation therapy to the prostate and pelvic lymph nodes for a total dose of 4500 cGy in 25 fractions from 7/24/09 through 8/28/09. On 8/31/09, he underwent catheter implantation with tenting of the bladder wall for an HDR brachytherapy boost to the prostate of 1900 cGy in two fractions.

The patient received his final leuporelin depot injection on 3/11/11, and his PSA rose from nadir concurrent with testosterone recovery (Fig. 1a). Once his testosterone returned to the range of normal, his PSA continued to slowly climb, and an imaging workup was initiated in April 2013. Repeat Tc99m bone scan showed no evidence of osseous

metastases, but a CT scan of the pelvis demonstrated a 1.9 cm enhancing nodule within the left posterior inferior aspect of the urinary bladder immediately superior to the prostate base (Fig. 1b). Transurethral resection of the bladder wall mass on 7/23/13 demonstrated Gleason grade 4 + 5 prostate adenocarcinoma with negative surgical margins (Fig. 1c). Review of a treatment planning CT scan obtained after implantation on 8/31/09 showed a single catheter protruding through the left posterior inferior aspect of the bladder wall at the eventual site of tumor recurrence (Fig. 1d). Following surgery, multi-parametric endorectal coil MRI of the prostate with diffusion and spectroscopy showed no suspicious lesions within the prostate itself and no evidence of residual disease within the bladder.

After surgery, the patient's PSA fell to the range of normal, consistent with the existence of a solitary bladder recurrence. However, from January through May 2014, his PSA climbed from 1.0 to 9.7 ng/mL with a doubling time of approximately 2 months (Fig. 2a). F18 sodium fluoride positron emission tomography in April 2014 revealed no evidence of distant metastases. Moreover, a repeat multi-parametric MRI of the prostate with diffusion and spectroscopy showed no indication of intra-prostatic malignancy. However, the left posterior inferior aspect of the

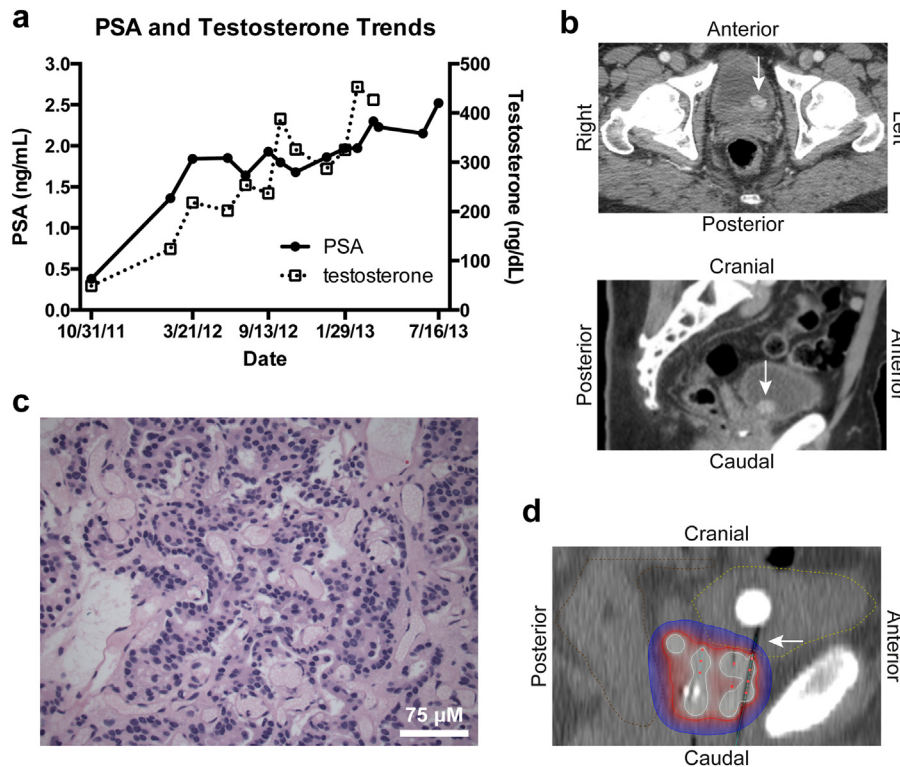


Fig. 1. First recurrence. (a) PSA (solid line, circles) and testosterone (dashed line, squares) trends following PSA nadir on 10/31/11. (b) Axial (upper) and sagittal (lower) CT images from April 2013 demonstrating a 1.9 cm enhancing nodule in the left posterior inferior bladder lumen (arrows), immediately superior to the prostate. (c) Hematoxylin and eosin stain after transurethral resection of bladder tumor revealing Gleason grade 4 + 5 prostate adenocarcinoma. (d) Post-implant CT scan from 8/31/09 showing protrusion of a solitary catheter through the left inferior posterior bladder wall (arrow) at the eventual site of tumor recurrence. Rectum, bladder, and prostate contours are shown in brown, yellow, and red, respectively. Blue, red, and white color-wash delineates 950 cGy, 1900 cGy, and 2850 cGy isodose lines, respectively. PSA = prostate-specific antigen. (For interpretation of references to color in this figure legend, the reader is referred to the web version of this article.)

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