Outcomes after Urethroplasty for Radiotherapy Induced Bulbomembranous Urethral Stricture Disease

Matthias D. Hofer,* Lee C. Zhao,* Allen F. Morey,† J. Francis Scott,* Andrew J. Chang,* Steven B. Brandes‡ and Chris M. Gonzalez§,||

From the Department of Urology, Northwestern University, Feinberg School of Medicine, Chicago, Illinois (MDH, CMG), Department of Urology, University of Texas Southwestern, Dallas, Texas (LCZ, AFM, JFS), and Department of Urology, Washington University, St. Louis, Missouri (AJC, SBB)

Purpose: We recently demonstrated that radiotherapy induced urethral strictures can be successfully managed with urethroplasty. We increased size and followup in our multi-institutional cohort, and evaluated excision and primary anastomosis as treatment for radiotherapy induced urethral strictures.

Materials and Methods: A retrospective review was performed of 72 patients from 3 academic institutions treated for radiotherapy induced bulbomembranous strictures. Outcome parameters of successful repair included recurrence, incontinence and erectile dysfunction.

Results: Among the 72 men treated for radiotherapy induced strictures 66 (91.7%) underwent excision and primary anastomosis. Mean followup was 3.5 years (median 3.1, range 0.8 to 11.2). Prostate cancer was the most common reason for radiotherapy (in 64 of 66, 96.9%). External beam radiotherapy and brachytherapy were performed in 28 of 66 men (42.4%) each, and a combination of both was performed in 9 (13.6%). Mean time from radiation to excision and primary anastomosis was 6.4 years (range 1 to 20) and mean stricture length was 2.3 cm (range 1 to 6). Successful reconstruction was achieved in 46 men (69.7%). Mean time to recurrence was 10.2 months (range 1 to 64) with new onset of incontinence observed in 12 men (18.5%). This was associated with stricture length greater than 2 cm ($p = 0.013$) and treatment center ($p < 0.001$). The rate of erectile dysfunction remained stable (preoperative 45.6%, postoperative 50.9%, $p = 0.71$). Radiotherapy type did not affect stricture length ($p = 0.41$), recurrence risk ($p = 0.91$), postoperative incontinence ($p = 0.88$) or erectile dysfunction ($p = 0.53$).

Conclusions: Radiotherapy induced bulbomembranous urethral strictures can be successfully managed with excision and primary anastomosis. Substitution urethroplasty with graft or flap is needed infrequently. Patients should be counseled on the potential risks of urinary incontinence and erectile dysfunction.

Key Words: urethral stricture; radiotherapy; anastomosis, surgical

Abbreviations and Acronyms

BT = brachytherapy

EBR = external beam radiation

EPA = excision and primary anastomosis

Accepted for publication October 29, 2013.

Study received institutional review board approval.

* Nothing to disclose.

† Financial interest and/or other relationship with AMS, Coloplast and GSK.

‡ Financial interest and/or other relationship with AMS, Allergan and Astellas.

§ Correspondence: Northwestern University, Feinberg School of Medicine, 675 North St. Clair St., Galter 20-150, Chicago, Illinois 60611.

|| Financial interest and/or other relationship with Aurasense and AMS.

Editor's Note: This article is the third of 5 published in this issue for which category 1 CME credits can be earned. Instructions for obtaining credits are given with the questions on pages 1480 and 1481.

TREATMENT options for prostate cancer include radical prostatectomy, external beam radiation and/or brachytherapy[1] and increasingly proton beam therapy. Each radiation modality has its particular side effects[1] yet all are associated with the development of urethral strictures (bulbar strictures and/or membranous stenoses, both referred to as strictures in this report as most have a bulbar component involving corpus

0022-5347/14/1915-1307/0
THE JOURNAL OF UROLOGY®

http://dx.doi.org/10.1016/j.juro.2013.10.147
Vol. 191, 1307-1312, May 2014
Printed in U.S.A.

spongiosum). Stricture rates are reported to be 2% for single treatment EBR, 4% for BT, 11% after combination therapy[2] and nearly 32% after high dose BT.[3] Radiation induced strictures are thought to be the result of periurethral fibrosis secondary to vascular damage and ischemia,[4] and recurrence rates are generally higher compared to strictures of other etiology.[5,6] We previously reported on the pooled outcomes of patients after urethroplasty for radiation induced strictures from 3 different institutions.[7] In this series strictures were encountered exclusively in the bulbar or membranous urethra with an average length of 3 cm and they were amenable to EPA in the majority of cases.[7] Successful reconstruction was achieved in nearly 75% of these patients, of whom 84% were treated with EPA. Although success rates were not as high as those reported after EPA for traumatic urethral disruption,[8] similar success rates for EPA for radiation induced strictures have been confirmed with single institutional data.[9]

In this study we further investigated the outcomes of patients treated with EPA for radiation induced urethral stricture. Cohort size and followup of men from our original study were increased. We hypothesize that the majority of radiation induced urethral strictures are located in the bulbomembranous area and amenable to EPA.

MATERIALS AND METHODS

We retrospectively collected data on patients at Northwestern University, Chicago, Illinois; University of Texas Southwestern, Dallas, Texas and Washington University, St. Louis, Missouri. Institutional review board approval was obtained from each institution. All urethroplasty procedures were completed by the reconstructive urologist from each institution. Preoperatively the patients had a period of urethral rest when necessary, with suprapubic tube placement for 3 months (University of Texas Southwestern) or removal of chronic indwelling Foley and cessation of intermittent self-catheterization with suprapubic tube placement reserved for those in urinary retention (Northwestern University, Washington University).

EPA was performed in accordance with published techniques[10] and as previously described.[7] The patient was placed in the dorsal or exaggerated lithotomy position. A midline incision over the perineum was made and carried to the bulbospongiosus muscle, which was divided in its midline and the corpus spongiosum exposed. Proximal and distal extent of the stricture were defined with cystoscopy and calibration. After sufficient urethral mobilization, the diseased component of the urethra and corpus spongiosum was excised. Both urethral ends were spatulated and anastomosed with 8 to 12 interrupted absorbable sutures. If encountered, fibrosis due to radionecrosis of the prostate was resected until healthy mucosa was reached. A pituitary rongeur was used to remove the necrotic tissue of the prostate under direct vision (University of Texas Southwestern). A Capio® device (an instrument developed for transvaginal sacrospinous ligament fixation) was used for suture placement in deep, narrow areas in select cases (Northwestern University). No case required pubectomy, or extensive corporal splitting or mobilization for exposure.

We used a retrospective medical record review of patients in whom urethral stricture developed after pelvic radiation therapy. Inclusion criteria were treatment for urethral stricture after pelvic radiation therapy by 1 of 3 reconstructive urologists (AFM, SBB, CMG) with a minimum 6-month followup. Patients were followed with a minimum of 1 postoperative visit and most were followed at regular intervals thereafter. Followup data (presence/absence of recurrence, incontinence or erectile dysfunction) were censored at the date of the last visit. The primary outcome was alleviation of the stricture symptoms (nonrecurrence of urethral stricture disease), and the secondary outcomes were assessment of urinary incontinence and erectile dysfunction after EPA. As there are currently no suitable and widely accepted patient reported outcome measures for the evaluation of urethral stricture disease, we relied on patient reported complaints of lower urinary tract symptoms, urinary incontinence, and erectile function preoperatively and postoperatively, as well as history, physical examination and post-void residual. Recurrence of urethral stricture was defined as urethral narrowing to 16Fr or less on cystoscopy. The chi-square and Student's t-test were used to determine significance.

RESULTS

A total of 72 patients with radiation induced urethral stricture were included in the study, of whom 35 were treated at University of Texas Southwestern, 19 at Northwestern University and 18 at Washington University. Of these 72 men 66 (91.7%) underwent urethral reconstruction with EPA and the remaining 6 (8.3%) were treated with substitution urethroplasty using a graft or flap. The majority of men had undergone radiation for the treatment of prostate cancer (64, 96.9%) and 2 (3.1%) had been treated for colorectal cancer (table 1). External beam radiation or brachytherapy was used in 28 cases (42.4%) each, and a combination was used in 9 (13.6%). One patient (1.5%) underwent proton beam radiation therapy.

A history of smoking was reported by 25 of 66 men (38.5%) and 8 of the 25 (32%) were current smokers. Lower urinary tract symptoms were reported by 63 of 66 men (95.5%), of whom 36 (57.1%) had obstructive symptoms, 9 (14.3%) had irritative symptoms and 15 (23.8%) had both. Bulbar urethral stricture was diagnosed in 26 of the 66 men (39.4%) and bulbomembranous stricture in