Delayed Reconstruction of Bulbar Urethral Strictures is Associated with Multiple Interventions, Longer Strictures and More Complex Repairs

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Purpose: Prior to urethral reconstruction many patients with stricture undergo a variable period during which endoscopic treatments are performed for recurrent obstructive symptoms. We evaluated the association among urethroplasty delay, endoscopic treatments and subsequent reconstructive outcomes.

Materials and Methods: We reviewed the records of men who underwent primary bulbar urethroplasty from 2007 to 2014. Those with prior urethroplasty, penile and/or membranous strictures and incomplete data were excluded from analysis. Men were stratified by a urethroplasty delay of less than 5, 5 to 10 or greater than 10 years from diagnosis.

Results: A total of 278 primary bulbar urethroplasty cases with complete data were evaluated. Median time between stricture diagnosis and reconstruction was 5 years (IQR 2–10). Patients underwent an average ± SD of 0.9 ± 2.4 endoscopic procedures per year of delay. Relative to less than 5 and 5 to 10 years a delay of greater than 10 years was associated with more endoscopic treatments (median 1 vs 2 vs 5), repeat self-dilations (13% vs 14% vs 34%), strictures longer than 2 cm (40% vs 39% vs 56%) and complex reconstructive techniques (17% vs 17% vs 34%). An increasing number of endoscopic treatments was independently associated with strictures longer than 2 cm (OR 1.06, $p = 0.003$), which had worse 24-month stricture-free survival than shorter strictures (83% vs 96%, $p = 0.0003$). Each consecutive direct vision internal urethrotomy was independently associated with the risk of urethroplasty failure (HR 1.19, $p = 0.02$).

Conclusions: Urethroplasty delay is common and often associated with symptomatic events managed by repeat urethral manipulations. Endoscopic treatments appear to lengthen strictures and increase the complexity of repair.

Key Words: urethral stricture; endoscopy; complications; failure to rescue, health care; reconstructive surgical procedures

Abbreviations and Acronyms

DVIU = direct visual internal urethrotomy

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In recently published guidelines endoscopic urethral manipulation has remained an acceptable primary treatment option for short (2 cm or less) bulbar strictures.[1,2] The practice patterns of most board certified urologists reflect these recommendations since 93% and 86% perform dilation and/or DVIU to treat anterior urethral strictures.[3,4] Despite the popularity of endoscopic stricture management these treatments have consistently been associated with an alarmingly high rate of failure.[5] A contemporary review of the literature highlighted the approximately 40%

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variability in the primary success rate.[1] Further repetitive endoscopic treatments ultimately fail in most instances.[6,7]

In our practice we have observed that many men present for urethroplasty after a prolonged delay following the initial stricture diagnosis. These lengthy intervals are often punctuated by symptomatic events requiring repetitive and ultimately futile urethral manipulations in the form of endoscopic treatment or self-dilation. Evidence now suggests that these endoscopic measures may lengthen urethral strictures, resulting in the need for more complex repairs.[8] This is of particular importance given that lengthier strictures greater than 2 cm, especially those located in the distal bulb, may be more prone to urethroplasty failure.[9]

To our knowledge the impact of reconstructive delay on urethroplasty outcomes remains unknown but it may be quite deleterious. Histological evidence suggests that in addition to repetitive urethral trauma, chronic high pressure voiding may contribute to the progression of squamous metaplasia, spongiofibrosis and ultimately stricture complexity.[10,11]

We hypothesized that an increasing urethroplasty delay is associated with a greater number of urethral manipulations, resulting in longer strictures, more challenging repairs and worse reconstructive outcomes. The objective of this study was to characterize urethral stricture outcomes in a select group of men who underwent primary bulbar urethroplasty, stratified by the duration of the reconstructive delay.

PATIENTS AND METHODS

After receiving institutional review board approval we evaluated our prospectively maintained, single surgeon urethral stricture database to identify patients who underwent open urethral reconstruction from 2007 to 2014 at 1 of 3 academic hospitals, including 662 at University of Texas Southwestern Medical Center. To identify patients considered to be ideal candidates for endoscopic treatment this analysis was limited to 278 men with primary (first time) bulbar urethral stricture. Excluded from study were 346 patients with a history of previous urethroplasty, isolated penile or radiation induced membranous urethral strictures, pelvic fracture urethral disruption or posterior urethral stenosis. Also excluded were 38 primary bulbar cases with incomplete historical data.

Men were stratified by the duration (less than 5, 5 to 10 or greater than 10 years) between the initial urethral stricture diagnosis and formal urethroplasty. Reconstructive delay was calculated as the time between the initial stricture diagnosis and primary open urethral reconstruction. The date of stricture diagnosis was defined as the date of the initial diagnostic procedure, that is retrograde urethrogram, voiding cystourethrogram or cystoscopy. If not available, the date of the first transurethral treatment served as an alternative. When the date of diagnosis predated available records, the patient history was used to obtain the date of the original diagnosis.

Urethral stricture anatomical location and complexity were characterized by preoperative imaging. Bulbar stricture length was determined at the time of urethroplasty. In most patients a stricture length cutoff point of 2 cm, particularly in the mid to distal bulbar urethra,[9] was used to determine the reconstructive technique. This has generally been the point at which anastomotic urethroplasty vs more complex reconstruction (substitution techniques) is indicated.[12–14] Transurethral endoscopic treatments included DVIU or any endoscopic assisted urethral dilation with sounds or a balloon. Intermittent self-dilation was defined as patient reported use of disposable sounds or catheters before surgical reconstruction to maintain urethral lumen patency.

After urethroplasty patients were followed via an office evaluation at 3 months by AUA SS (American Urological Association symptom score) and then as determined by the complexity of the condition and urinary related concerns. Details regarding urethroplasty success were obtained by reviewing office examinations, operative reports, and written and/or telephone correspondence. Urethroplasty failure was defined as the need for recurrent urethral interventions such as endoscopic treatment, subsequent catheterization or repeat urethroplasty.

In the primary analysis we assessed urethral stricture characteristics and treatment outcomes stratified by the reconstructive delay. In the secondary analysis we evaluated outcomes stratified by a urethral stricture cutoff point of 2 cm. Continuous variables were evaluated by the nonparametric Wilcoxon rank sum or Kruskal-Wallis test and categorical variables were assessed by the Fisher exact test. Stricture-free survival following urethroplasty was estimated by the Kaplan-Meier method. Forward stepwise logistic regression analysis was used to identify factors associated with bulbar urethral stricture length greater than 2 cm at the time of reconstruction. Cox proportional hazard regression models were applied to identify variables associated with urethroplasty failure with $p < 0.05$ considered statistically significant. Statistical analyses were performed with SAS®.

RESULTS

A total of 1,287 urethral reconstructive procedures were performed by the senior surgeon from 2007 to 2014. For this analysis 278 of 316 men treated with primary bulbar urethroplasty at our tertiary academic referral center (1 of 3 institutions) who had complete data available were identified for analysis. Mean $\pm$ SD time between stricture diagnosis and formal reconstruction was 9.1 ± 11.6 years (median 5, IQR 2–10), during which patients underwent a mean of 0.9 ± 2.4 endoscopic procedures per year of delay (median 0.3, IQR 0–0.9). Median age at urethroplasty was 49 years (IQR 37–62). The most common urethral stricture etiologies were