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High Regional Variation in Urethroplasty in the United States

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Abstract

Purpose—We identified clinical and regional factors associated with the use of urethroplasty vs repeat endoscopic management for urethral stricture disease.

Materials and Methods—We analyzed claims for patients 18 to 65 years old in the 2007 to 2011 MarketScan® Commercial Claims and Encounters Database with a diagnosis of urethral stricture. The primary outcome was treatment with urethroplasty vs repeat endoscopic management, defined as more than 2 dilations or direct vision internal urethrotomies. The likelihood of urethroplasty vs repeat endoscopic management was determined for each major metropolitan area in the United States. Multivariate logistic regression was done to identify factors associated with urethroplasty.

Results—We identified 41,056 patients with urethral stricture, yielding a diagnosis rate of 296/100,000 men in MarketScan. Repeat endoscopic management and urethroplasty were performed in 2,700 and 1,444 patients, respectively. Compared to patients treated with repeat endoscopic management those with urethroplasty were younger (median age 44 vs 54 years) and more likely to have a Charlson comorbidity score of 0 (84% vs 77%), have traveled out of a metropolitan area for care (34% vs 17%) and have a reconstructive urologist in the treatment metropolitan area (76% and 62%, each $p < 0.001$). When controlling for age and Charlson comorbidity score, travel out of a metropolitan area (OR 2.7, 95% CI 2.2–3.3) and a reconstructive urologist in the treatment metropolitan area (OR 2.0, 95% CI 1.7–2.5) were associated with a greater likelihood of urethroplasty vs repeat endoscopic management.

Conclusions—Despite the well established benefits of urethroplasty compared to repeat endoscopic management a strong bias for repeat endoscopic management exists in many regions in the United States.

Keywords

urethra; urethral stricture; physician's practice patterns; endoscopy; reconstructive surgical procedures

Since its introduction in 1974,¹ DVIU has been widely adopted by urologists to manage urethral stricture disease. While initial reports suggested a modest 82% short-term success

rate,² subsequent well designed prospective studies consistently demonstrated a much lower success rate for DVIU for all but the most favorable strictures.^{3–6}

In patients with at least 60 months of followup Pansadoro and Emiliozzi reported an overall DVIU success rate of 32%.³ They identified stricture characteristics associated with considerably worse outcomes, including length greater than 1 cm, caliber 15Fr or less, penile urethral location and previous failed DVIU. Other groups confirmed these findings and found that urethral dilation had efficacy equal to DVIU.^{4–6} In contrast to the poor results of endoscopic approaches, urethroplasty has consistently shown 75% to 100% lifetime success ranging across a wide spectrum of disease characteristics.⁷

Despite these findings endoscopic approaches remain the most common treatment for male urethral stricture disease in the United States.^{7–9} This trend has been attributed to a number of factors, including unfamiliarity with published outcomes¹⁰ and a lack of qualified reconstructive urologists in certain regions of the United States.¹¹

To inform efforts to improve access to urethroplasty in the United States we determined utilization patterns of urethroplasty and repeat endoscopic management by MA. We also assessed the influence of clinical and regional factors on the likelihood of undergoing urethroplasty vs repeat endoscopic management. We hypothesized that patients treated in a MA with a reconstructive urologist were more likely to undergo urethroplasty than repeat endoscopic management.

Treatment for urethral stricture disease is done in a wide variety of clinical settings and the benefits of urethroplasty compared to endoscopic approaches are likely most pronounced in a younger, working age population. Therefore, we analyzed claims from the MarketScan Commercial Claims and Encounters Database, which allows for longitudinal tracking across outpatient, inpatient and emergency settings for employees and dependents covered by employer sponsored private health insurance.

METHODS

Data were obtained from the MarketScan Commercial Claims and Encounters Database from January 1, 2007 through December 31, 2011. This data set, which was fully described previously,¹² is a HIPAA (Health Insurance Portability and Accountability Act) compliant convenience sample of employer and health plan sourced claims data in the United States.

Study inclusion criteria were men 18 to 65 years old with an ICD-9 diagnosis of urethral stricture for a study sample of 44,969 men. Analysis was limited to those younger than 65 years because of the potential for incomplete claims by dual Medicare eligible enrollees. To exclude patients with posterior urethral strictures, which may be less amenable to open surgical techniques, 3,740 with an ICD-9 diagnosis of prostate cancer and 131 with a CPT code consistent with surgery for bladder neck contracture were excluded from analysis. We also excluded 42 patients diagnosed with urethral cancer.

Analysis was further limited to patients undergoing repeat endoscopic management (greater than 2 dilations or DVIUs) or urethroplasty based on CPT code. We used a conservative

definition of repeat endoscopic management (greater than 2 procedures) to restrict this cohort to patients with highly refractory urethral strictures, who are most likely to benefit from urethroplasty than from repeat endoscopic management. Meatoplasty and meatotomy were not included in study. Endoscopic procedures in which a concomitant and unrelated endourological procedure was performed, eg transurethral resection of the prostate, were also not included. Patients were categorized according to the first claim for urethroplasty or the third claim for endoscopic management (greater than 2 dilations or DVIUs). The supplementary Appendix (<http://www.jurology.com/>) lists CPT and ICD-9 definitions.

The MA where the index procedure was performed was determined by cross-referencing the 3-digit provider ZIP Code with a list of market areas (<https://www.zipinfo.com/>). In contrast to other geographic schemes, such as metropolitan statistical areas, the advantages of these market areas are that there is no overlap among them, ZIP Codes are not split across them and they cover the entire United States, including rural areas.

Clinical covariates included patient age and Charlson comorbidity score. Patient age was defined as age at the time of the index procedure or at the time of the first diagnosis if no index procedure was performed. The Charlson comorbidity score was calculated using the index procedure and all inpatient hospital admissions for the preceding 12 months.¹³ Scores were not calculated for patients with less than 12 months of enrollment before the index procedure, which included 19% of those treated with urethroplasty or repeat endoscopic management. Scores were dichotomized as 0 vs 1 or greater.

Regional covariates included travel out of an MA and the presence of a reconstructive urologist in the treating MA. Travel out of an MA was defined as an index procedure performed in a MA that did not include the employee residential ZIP Code. A reconstructive urologist was defined as a member of GURS, excluding 6 who were retired and 54 whose primary affiliation was a pediatric hospital or practice during the study period. A total of 137 reconstructive urologists were identified. A MA was considered to have a reconstructive urologist present if the GURS roster listed that provider in the MA at any time from 2007 to 2011.

Statistical analysis was performed using Stata! SE 11.2. For univariate association of covariates with repeat endoscopic management vs urethroplasty we used the Wilcoxon rank sum test for continuous variables while the Pearson chi-squared test was used for categorical variables. Multivariate logistic regression analysis was performed using stepwise backward elimination.

RESULTS

We identified 41,056 patients with urethral stricture disease. The mean number of eligible enrollees per quarter was 13,854,879, yielding a urethral stricture diagnosis rate of 296/100,000 men. The median age of men with urethral stricture disease was 51 years (range 18 to 64). During the study period 41,357 endoscopic procedures and 1,517 urethroplasties were performed (table 1).

A total of 2,700 patients underwent repeat endoscopic management and 1,444 underwent urethroplasty. Compared to patients treated with repeat endoscopic management those treated with urethroplasty were younger (median age 44 vs 54 years), more likely to have a Charlson comorbidity score of 0 (84% vs 77%), more likely to have travelled out of the MA for care (34% vs 17%) and more likely to have a GURS provider in the MA where care was provided (76% vs 62%, each $p < 0.001$).

In MAs with 30 or more patients who underwent repeat endoscopic management or urethroplasty we determined the total number of patients and the ratio of patients undergoing urethroplasty to repeat endoscopic management (see figure). There was considerable variability in urethral stricture treatment by MA. When controlling for age and Charlson comorbidity score, travel out of a MA (OR 2.7, 95% CI 2.2–3.3) and a reconstructive urologist present in the treatment MA (OR 2.0, 95% CI 1.7–2.5) were associated with a greater likelihood of urethroplasty vs repeat endoscopic management (table 2).

DISCUSSION

We identified significant variability in urethroplasty utilization rates among major metropolitan areas in the United States. Nonclinical factors, such as the presence of a reconstructive urologist in the treatment MA and the willingness of a patient to travel to a different MA for treatment, were associated with a greater likelihood of undergoing urethroplasty compared to repeat endoscopic management.

In most cases endoscopic management of urethral strictures is not durable, particularly after failed attempts at endoscopic management.^{3,5,6} Despite this fact there is a strong bias among urologists to treat urethral stricture disease endoscopically rather than refer the patient to a reconstructive urologist even when endoscopic treatment is almost certain to be futile.^{10,14} In a nationwide survey of practicing urologists in the United States only 20% responded that they would refer a patient with a bulbar urethral stricture refractory to internal urethrotomy to a specialist while 31% would continue to manage the stricture endoscopically. Of the respondents 74% stated that they believed that the literature supports a reconstructive surgical ladder in which urethroplasty is only performed after repeat failure of endoscopic methods.¹⁰ This strategy exposes the patient to potentially futile surgery and is associated with increased cost, particularly when endoscopic procedures are repeated.^{15–17}

These findings suggest that overuse of repeat endoscopic management is in part due to a lack of knowledge among providers about appropriate treatment algorithms for patients with urethral stricture disease. If true, these trends could be readily modified by developing guidelines for managing urethral stricture disease.

In our study only 67% of patients who underwent repeat endoscopic management or urethroplasty were treated in a MA with a reconstructive urologist present and 23% of all patients sought care in a MA other than the one where they lived. These findings suggest that there is a shortage of reconstructive urologists, a finding consistent with a study of case logs from certifying and recertifying urologists from 2004 to 2009.¹¹ Burks et al identified multiple states in which no urethroplasties were done during the study period, including

states with a large population.¹¹ They concluded that large geographic areas in the United States lack urethroplasty care.

While regional disparities in urethroplasty providers may be overcome by referral to specialty centers, there is evidence that patients have a strong preference for local care and centralization may result in unreasonable travel burdens for surgical patients.^{18,19} Finlayson et al found that 75% of patients awaiting elective surgery would prefer local surgery even when travel to a regional medical center would result in a lower operative mortality risk.¹⁸ These findings suggest that efforts to improve access to urethroplasty should include attempts to train and hire reconstructive urologists in underserved regions, in addition to encouraging referrals to specialty centers.

There was a strong relationship in our cohort between patient age and the likelihood of urethroplasty. Compared to 55 to 64.9-year-old patients those who were 18 to 44.9 years old were almost 4 times more likely to be treated with urethroplasty. Although to our knowledge this association has not been described previously, it is not surprising since older patients are more likely to have coexisting conditions that could result in higher complication and failure rates. We attempted to control for this by including Charlson comorbidity score as a covariate in our model but not all relevant comorbidities are included in this score. Despite concerns about older patients urethroplasty can be performed safely²⁰ and definitive treatment should not be withheld based on age alone.

The diagnosis rate for urethral stricture disease in this cohort of young, healthy men was 296/100,000. This is similar to the reported rate of urethral stricture disease in the Veterans Affairs population (274/100,000 men)⁸ but more than 15-fold lower than the diagnosis rate in an older cohort of Medicare patients (4,465/100,000 men).⁹ The dramatic increase in the diagnosis rate of urethral stricture disease with increasing age is consistent with previous reports and seems to be most pronounced around age 60 years.²¹

There were a number of limitations to this study. As with any administrative data set, detailed clinical data were not available, which limited our ability to distinguish among various etiologies and severities of urethral stricture. Therefore, we chose a conservative definition for repeat endoscopic management, excluding from analysis patients who underwent 1 or 2 endoscopic procedures. This definition produced a conservative estimate (potentially an underestimate) of the true incidence of unnecessary endoscopic surgery for urethral stricture disease.

While this data set was well suited to longitudinal tracking of patients with urethral stricture disease, provider identifiers are withheld by most data contributors to MarketScan, limiting our ability to identify and adjust for provider specific practice patterns. Also, claims data are submitted to MarketScan by various employers and insurers, and not collected in a systematic or sampled fashion. The lack of a clearly defined or sampled cohort in MarketScan limits the interpretation of surgical volumes in our cohort. Regions with large contributions to the data set are overrepresented and appear to have larger surgical volumes than less represented regions. To compensate for this limitation we based comparisons

among MAs on the ratio of patients who underwent urethroplasty vs repeat endoscopic management and not the overall number of procedures.

CONCLUSIONS

While the benefits of urethroplasty are well established, there is a strong bias in many MAs toward repeat endoscopic management, although this approach is unlikely to be successful. Future efforts to improve access to urethroplasty should focus on specific interventions that can mitigate these factors, such as developing clear urethral stricture treatment guidelines and improving access to urethroplasty providers in underserved areas.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations and Acronyms

DVIU	direct vision internal urethrotomy
GURS	Society of Genitourinary Reconstructive Surgeons
MA	metropolitan area

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Figure.

Variation in urethral stricture disease treatment patterns. Metropolitan areas with fewer than 30 patients not shown. Increasing circle size indicates more patients undergoing repeat endoscopic management or urethroplasty in each MA. Increasingly dark circles indicate greater likelihood of urethroplasty vs repeat endoscopic management in each MA. Red circles indicate MAs with 1 or more practicing nonpediatric members of GURS in 2007 to 2011.

Table 1

Demographic data on patients treated with repeated endoscopic management or urethroplasty

	Overall	Repeat Endoscopy	Urethroplasty	Unadjusted OR (95% CI) *
No. pts	41,056	2,700	1,444	–
Age:				–
Median (range)	51 (18–64)	54 (18–64)	44 (18–64) *	–
No. 18–44.9 (%)	14,590 (36)	704 (26)	786 (54)	5.0 (4.2–5.9) †
No. 45–54.9 (%)	11,560 (28)	796 (29)	389 (27)	2.2 (1.8–2.6) †
No. 55–64.9 (%)	14,906 (36)	1,200 (44)	269 (19)	Referent
No. Charlson comorbidity score (%):				
1 or Greater	–	540 (23)	163 (16)	1.6 (1.3–1.9) †
0	–	1,809 (77)	845 (84)	–
Travel out of MA (%)	–	395 (17)	365 (34)	2.5 (2.1–2.9) †
Treatment MA reconstructive urologist (%)	–	1,451 (62)	834 (76)	1.9 (1.6–2.3) †

* Likelihood of urethroplasty.

† p < 0.001.

Table 2

Multivariate logistic regression of likelihood of urethroplasty vs repeat endoscopic management

	OR (95% CI)
Age:	
18–44.9	3.9 (3.1–4.8)*
45–54.9	1.8 (1.4–2.3)*
55–64.9	Referent
Charlson comorbidity score 1 or greater	1.1 (0.8–1.4)
Travel out of MA	2.7 (2.2–3.3)*
Treatment MA reconstructive urologist	2.0 (1.7–2.5)*

*
p <0.001.