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## Measuring and Predicting Patient Dissatisfaction after Anterior Urethroplasty Using Patient Reported Outcomes Measures

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**Purpose:** Subjective measures of success after urethroplasty have become increasingly valuable in postoperative monitoring. We examined patient reported satisfaction following anterior urethroplasty using objective measures as a proxy for success.

**Materials and Methods:** Men 18 years old or older with urethral strictures undergoing urethroplasty were prospectively enrolled in a longitudinal, multi-institutional urethroplasty outcomes database. Preoperative and postoperative assessment included questionnaires to assess lower urinary tract symptoms, pain, satisfaction and sexual health. Analyses controlling for stricture recurrence (defined as the inability to traverse the reconstructed urethra with a flexible cystoscope) were performed to determine independent predictors of dissatisfaction.

**Results:** At a mean followup of 14 months we found a high 89.4% rate of overall postoperative satisfaction in 433 patients and a high 82.8% rate in those who would have chosen the operation again. Men with cystoscopic recurrence were more likely to report dissatisfaction (OR 4.96, 95% CI 2.07–11.90) and men reporting dissatisfaction had significantly worse uroflowmetry measures (each  $p < 0.02$ ). When controlling for recurrence, multivariate analysis revealed that urethra and bladder pain (OR 1.71, 95% CI 1.05–2.77 and OR 2.74, 95% CI 1.12–6.69, respectively), a postoperative decrease in sexual activity (OR 4.36, 95% CI 2.07–11.90) and persistent lower urinary tract symptoms (eg straining to urinate OR 3.23, 1.74–6.01) were independent predictors of dissatisfaction.

### Abbreviations and Acronyms

BMI = body mass index  
 CLSS = Core Lower Urinary Tract Symptom Scale  
 I-PSS = International Prostate Symptom Score  
 LUTS = lower urinary tract symptoms  
 MSHQ-Ej = Male Sexual Health Questionnaire-Ejaculatory Section  
 PROM = patient reported outcome measure  
 TURNS = Trauma and Urologic Reconstruction Network of Surgeons  
 USD = urethral stricture disease

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**Conclusions:** Overall satisfaction after anterior urethroplasty is high and traditional measures of surgical success strongly correlate with satisfaction. However, independently of the anatomical appearance of the reconstructed urethra, postoperative pain, sexual dysfunction and persistent lower urinary tract symptoms were predictors of patient dissatisfaction.

**Key Words:** urethral stricture, patient satisfaction, lower urinary tract symptoms, erectile dysfunction, pain

THE majority of men who present to urologists with USD present with voiding complaints, most commonly a slow or weak urinary stream, incomplete bladder emptying and urinary hesitancy.<sup>1,2</sup> These symptoms are often accompanied by a history of recurrent urinary tract infections and dysuria or lower urinary tract pain.<sup>3,4</sup> Importantly, such symptoms have been shown to negatively affect quality of life in men with USD.<sup>5,6</sup>

Urethroplasty is the gold standard for the repair of USD. There are many ways to perform urethroplasty but the unifying goal of each procedure is to create a durable reconstructed urethra that allows for unobstructed urination from the bladder. Traditionally, success after urethroplasty has focused on objective measures such as urinary flow rates, post-void residual volumes and appearance of the urethra on cystoscopy and/or retrograde urethrogram.<sup>7,8</sup> As surgical techniques have become more refined and urethroplasty procedures have become more widespread,<sup>9,10</sup> the incorporation of PROMs during postoperative visits has been recommended to fully evaluate surgical success.<sup>11,12</sup> Our research group previously noted that successful urethroplasty can improve dysuria and voiding pain.<sup>3</sup> Others have found that urethroplasty can result in improved patient reported LUTS and improved quality of life.<sup>13,14</sup>

The purpose of the current study was to assess patient satisfaction after anterior urethroplasty with the goal of determining preoperative and postoperative factors that are predictors of dissatisfaction. The study tested 2 hypotheses. 1) Traditional objective success rates, as determined by improved urinary flow rates and cystoscopic appearance of the urethra, would be strongly associated with satisfaction. 2) Dissatisfaction would depend on subjective measures of success, including pain improvement and postoperative sexual function.

## METHODS

### Study Subjects

Between June 2010 and June 2015, men 18 years old or older undergoing anterior urethroplasty at institutions participating in the TURNS outcomes study were asked to enroll in a prospective urethroplasty registry.

Participants underwent standard preoperative objective testing, including uroflowmetry and retrograde urethrography to assess the length, location and degree of stricture. Preoperative subjective testing consisted of a series of questionnaires, including I-PSS, SHIM, MSHQ-Ej<sup>15</sup> and CLSS.<sup>16</sup> The latter is a validated study assessing 10 lower urinary tract symptoms with a score of 0 to 3 for each symptom and a total score of 0 to 30. Nonvalidated sexual health, quality of life and satisfaction questions adapted from a series of preexisting urethroplasty outcomes literature were also administered.<sup>17,18</sup> In 2014 the questionnaire battery was modified to include the validated urethroplasty questionnaire by Jackson et al.<sup>11</sup>

Postoperative testing was performed initially at 3 to 6 months, and 12 months and yearly thereafter. Testing included uroflowmetry, cystoscopy and the series of questionnaires mentioned. For subjects who completed more than 1 postoperative series of questionnaires we used data only from the most recent visit for analysis. All clinical and demographic information obtained from these patients was stored in a web based FileMaker® database. Permission to collect data was obtained from the institutional review board at each TURNS member institution.

### Satisfaction Analysis

Satisfaction following anterior urethroplasty was assessed by asking men 2 questions, including 1) "Were you satisfied with your surgical procedure?" with answers on a 5-point Likert scale (very satisfied, satisfied, neither satisfied or unsatisfied and very unsatisfied) and 2) "If you could go back in time, would you still have agreed to undergo the urethral stricture surgery?" with answers of yes/no/maybe.

Satisfaction answers were compared to preoperative demographic data, operative data and postoperative objective/subjective data as described to assess for predictors of dissatisfaction. This was done first on univariate and then on multivariate analysis controlling for stricture recurrence, BMI in kg/m<sup>2</sup>, age and followup. The 5-point Likert scale was decreased to satisfied (very satisfied and satisfied) and unsatisfied (neither satisfied/unsatisfied, unsatisfied and strongly unsatisfied) for prediction analysis. The chi-square test and the t-test were used to determine univariate predictors of dissatisfaction using demographics, medical comorbidities, stricture characteristics, uroflowmetry and PROMs. A multivariate logistic regression model was constructed controlling for age, BMI, followup and stricture recurrence to calculate the adjusted OR of dissatisfaction for each significant univariate predictor. Recurrence was defined as inability to pass a 17Fr flexible cystoscope through the

**Table 1.** Patient reported satisfaction after anterior urethroplasty

	No. Pts (%)	Total No. (%)
Satisfaction level:	433	—
Very unsatisfied	7 (1.62)	46 (10.62)
Unsatisfied	12 (2.77)	—
Neither satisfied nor unsatisfied	27 (6.24)	—
Satisfied	133 (30.72)	387 (89.38)
Very satisfied	254 (58.67)	—
Would you repeat surgery?	429	—
Yes	355 (82.75)	355 (82.75)
Maybe	60 (13.99)	74 (17.25)
No	14 (3.26)	—

reconstructed urethra as noted on routine surveillance with or without symptoms of recurrence. All analyses were performed using SAS®, version 9.3 with statistical significance considered at  $p < 0.05$ .

## RESULTS

### Demographics

A total of 433 patients completed postoperative satisfaction testing after anterior urethroplasty at 7 TURNS institutions. The mean time of subjective satisfaction assessment was 14 months (range 3 to 25) postoperatively. Of these men 254 (58.7%) and 133 (30.7%) reported being very satisfied and satisfied with surgery, respectively, and 355 of 429 (82.8%) who responded to the question would repeat the operation (table 1). No demographic, stricture or

operative characteristics were associated with postoperative dissatisfaction, including the duration of followup (table 2).

### Objective Postoperative Measures and Satisfaction

Recurrent stricture was noted during cystoscopy in 14.0% of men. Cystoscopic recurrence was more common in the unsatisfied group than in the satisfied group (44.0% vs 11.0%,  $p < 0.01$ ). It was a strong predictor of dissatisfaction (age adjusted OR 7.35, 95% CI 2.86–18.90). There was no difference in followup between men with recurrent stricture on cystoscopy and those who were recurrence free (16.1 vs 13.3 months,  $p = 0.2871$ ). Satisfied men had higher postoperative maximum uroflowmetry rates (23.6 vs 18.7 cc/m<sup>2</sup>,  $p < 0.04$ ), higher average uroflowmetry rates (12.5 vs 8.5 cc/m<sup>2</sup>,  $p < 0.01$ ) and greater improvement in the uroflowmetry maximum rate (16.1 vs 7.5 cc/m<sup>2</sup>,  $p < 0.02$ ) and average rate (6.9 vs 1.2 cc/m<sup>2</sup>,  $p < 0.02$ ) than unsatisfied men. Postoperative post-void residual volume and total voided volume did not differ between the groups ( $p = 0.12$  and 0.13, respectively, table 2).

### Subjective Postoperative Voiding Measures and Satisfaction

Satisfied men reported significantly fewer LUTS than unsatisfied men as determined by I-PSS and CLSS (table 3). Most voiding symptoms on both questionnaires were associated with dissatisfaction (eg urgency, frequency, nocturia, hesitancy and

**Table 2.** Demographic, medical, surgical, stricture and uroflowmetry characteristics in 387 satisfied and 46 unsatisfied men

	Satisfied	Unsatisfied	p Value	
Mean ± SD age	45.27 ± 15.87	48.36 ± 12.78	0.2090	(t-test)
Mean ± SD BMI (kg/m <sup>2</sup> )	29.64 ± 6.85	31.15 ± 8.58	0.2760	(t-test)
Mean ± SD stricture length (cm)	4.07 ± 3.60	4.50 ± 3.61	0.4510	(t-test)
Mean ± SD operative time (mins)	178 ± 70	170 ± 61	0.5011	(t-test)
Mean ± SD blood loss (cc)	193 ± 179	167 ± 207	0.3799	(t-test)
Mean ± SD followup (mos)	13.90 ± 15.5	14.30 ± 14.6	0.8661	(t-test)
% Medical/social history:				
Diabetes (yes)	11.11	15.22	0.4401	(chi-square test)
Hypertension (yes)	27.91	41.30	0.0632	(chi-square test)
Hyperlipidemia (yes)	24.01	30.43	0.3572	(chi-square test)
Smoking history (yes)	25.06	28.26	0.5115	(chi-square test)
Alcohol history (yes)	55.04	63.04	0.3095	(chi-square test)
Obesity (BMI 30 kg/m <sup>2</sup> or greater) (yes)	35.92	45.65	0.2618	(chi-square test)
% Stricture:				
Previous direct vision internal urethrotomy (yes)	65.89	65.22	0.8683	(chi-square test)
Previous dilation (yes)	67.96	63.04	0.5646	(chi-square test)
Buccal graft (yes)	55.04	60.87	0.4641	(chi-square test)
Penile urethroplasty (yes)	11.11	8.69	0.5246	(chi-square test)
Mean ± SD uroflowmetry:				
Max flow rate (cc/m <sup>2</sup> )	23.58 ± 12.98	18.69 ± 13.02	0.0424	(t-test)*
Av flow rate (cc/m <sup>2</sup> )	12.53 ± 7.39	8.53 ± 6.34	0.0033	(t-test)*
Voided vol (cc)	323.56 ± 226.00	260.86 ± 194.60	0.1300	(t-test)
Post-void residual vol (cc)	64.55 ± 97.79	48.97 ± 45.93	0.1204	(t-test)
Δ Max flow rate (cc/m <sup>2</sup> )	16.11 ± 14.41	7.54 ± 12.59	0.0154	(t-test)*
Δ Av flow rate (cc/m <sup>2</sup> )	6.90 ± 9.63	1.19 ± 9.58	0.0172	(t-test)*

\* Statistically significant ( $p < 0.05$ ).

**Table 3.** Postoperative reported voiding complaints in 387 satisfied and 46 unsatisfied patients

Question	Satisfied	Unsatisfied	p Value (t-test)
<i>Mean CLSS (range 0–3/question, max score 30, continuous variable)</i>			
How many times do you typically urinate from waking in morning until sleeping at night?	0.45	0.63	0.2090
How many times do you typically urinate from sleeping at night until waking in morning?	0.74	1.13	0.0076*
How often do you have the following symptoms?:			
Sudden strong desire to urinate, which is difficult to postpone	0.79	1.28	0.0241*
Leaking of urine because you cannot hold it	0.52	1.06	0.0099*
Leaking of urine when you cough, sneeze or strain	0.28	0.47	0.1726
Slow urinary stream	0.45	1.50	<0.0001*
Need to strain when urinating	0.32	0.97	0.0025*
Feeling of incomplete emptying of bladder after urination	0.43	0.81	0.0375*
Pain in bladder	0.15	0.38	0.1321
Pain in urethra	0.40	0.88	0.0291*
If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about that?	1.08	3.45	<0.0001*
Total CLSS score	4.84	10.72	<0.0003*
Δ Total CLSS score	−13.82	−9.33	0.0797
<i>I-PSS (score 0–5/question, max 35)</i>			
In past month:			
How often have you had the sensation of not emptying your bladder?	0.54	1.56	0.0027*
How often have you had to urinate less than every 2 hours?	1.08	2.06	0.0015*
How often have you found you stopped and started again several times when you urinated?	0.45	1.13	0.0173*
How often have you found it difficult to postpone urination?	0.66	1.41	0.0265*
How often have you had a weak urinary stream?	0.52	1.84	0.0002*
How often have you had to strain to start urination?	0.41	0.97	0.0613
How many times did you typically get up at night to urinate?	1.18	1.75	0.0154*
If you were to spend the rest of your life with your urinary condition just the way it is now, how would you feel about that?	1.18	3.03	<0.0001*
Total I-PSS score	4.53	9.09	<0.0001*
Δ Total I-PSS score	10.08	6.22	0.0151*

\* Statistically significant ( $p < 0.05$ ).

incomplete emptying). However, on I-PSS and CLSS the symptom most strongly associated with postoperative dissatisfaction was a slow, weak urinary stream (each  $p < 0.01$ ). Satisfied men were also less likely to report urethral pain postoperatively ( $p < 0.03$ ).

### Postoperative Sexual Function and Satisfaction

Men reporting satisfaction had higher postoperative SHIM scores, corresponding to better erectile function (19.2 vs 16.1,  $p < 0.01$ ). They reported less change in postoperative SHIM scores relative to preoperative values than dissatisfied men (−0.04 vs −3.2,  $p < 0.01$ , table 4). Men reporting satisfaction had higher postoperative MSQH-Ej scores, signifying better ejaculatory function (15.0 vs 11.0,  $p < 0.01$ ). They also had greater postoperative improvement in MSHQ-Ej scores than dissatisfied men (2.4 vs 0.5,  $p = 0.09$ ).

Dissatisfied men were more likely to report an alteration in sexual frequency (52% vs 24%,  $p < 0.01$ ), new penile curvature (35% vs 17%,  $p < 0.02$ ), an alteration in penile length (48% vs 32%,  $p < 0.02$ ), partner perception of erectile dysfunction (39% vs 22%,  $p < 0.01$ ), decreased penile sensitivity (36% vs 20%,  $p < 0.02$ ) and a cold glans penis during erection (12% vs 3%,  $p < 0.01$ ) postoperatively compared to men who reported being satisfied (table 4).

### Postoperative Dissatisfaction Independent Predictors

When controlling for stricture recurrence, BMI, followup and age, we noted that persistent urinary symptoms, persistence (or appearance) of genitourinary pain and alterations in postoperative sexual function were the greatest drivers of postoperative dissatisfaction (table 5). Notably, men reporting dissatisfaction had fourfold greater odds of reporting a decrease in sexual activity (OR 4.36), were almost twice as likely to report genitourinary (urethra and bladder) pain (OR 1.71 and 2.74, respectively) and 3 times more likely to report the need to strain to urinate (OR 3.23). While urine flow rates were significant on univariate analysis (each  $p < 0.04$ ), they were not statistically significant in our multivariate logistic regression models (maximum flow rate OR 1.02, 95% CI 0.98–1.06).

## DISCUSSION

### Satisfaction after Urethroplasty

In this study we found a high percent of postoperative satisfaction after urethroplasty with a large majority of men reporting that they would have undergone the operation again. We observed a strong association of patient satisfaction with surgical success as determined by traditional

**Table 4. Postoperative sexual function in satisfied and unsatisfied men**

	Satisfied	Unsatisfied	p Value*
<i>MSHQ-Ej (score 0–5/question)</i>			
In past mo (mean score):			
How often have you been able to ejaculate when having sexual activity?	4.15	3.12	<0.0001†
How would you rate strength or force of your ejaculation?	3.42	2.49	0.0013†
How would you rate amount or volume of semen when you ejaculate?	3.68	2.78	0.0084†
If you have had any ejaculation difficulties or have been unable to ejaculate, have you been bothered by this?	3.89	2.65	<0.0001†
Total MSHQ Score	14.99	10.98	<0.0001†
Δ Total MSHQ Score	2.41	0.48	0.0998
<i>SHIM (score 0–5/question)</i>			
In past 6 mos (mean score):			
How do you rate your confidence that you could keep erection?	3.63	2.76	0.0002
When you had erections with sexual stimulation, how often were your erections hard enough for penetration?	4.02	3.35	0.0039
During sexual intercourse, how often were you able to maintain your erection after you had penetrated your partner?	4.00	3.51	0.0917
During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	4.07	3.44	0.0277†
When you attempted sexual intercourse, how often was it satisfactory for you?	4.00	3.07	<0.0001†
Total SHIM score	19.23	16.07	0.0056†
Δ Total SHIM score	−0.04	−3.16	0.0050†
<i>Other sexual function questions</i>			
Were you sexually active before surgery? (%):			0.0306†
Yes	86	74	
No	14	26	
Have you been sexually active since operation? (%):			0.0047†
Yes	79	61	
No	21	39	
Have you altered frequency of sexual intercourse since surgery because of changes in erectile function? (%):			<0.0001†
Yes	24	52	
No	76	48	
Have you noticed curvature to your erections that is new since surgery? (%):			0.0137†
Quite a bit	6	14	
Somewhat	11	21	
Not at all	83	65	
Has length of your penis changed since surgery? (%):			0.0183†
Quite a bit	6	16	
Somewhat	26	32	
Not at all	68	52	
Has your partner noticed change in your erectile function since surgery? (%):			0.0067†
Yes	22	39	
No	62	37	
No partner	16	24	
Were you on medications for erectile dysfunction prior to surgery? (%):			0.4720
Yes	8	11	
No	92	89	
Have you required medications for erectile dysfunction since your surgery? (%):			0.1980
Yes	12	19	
No	88	81	
Does glans of your penis swell during erection? (%):			0.3284
Yes	48	56	
No	52	44	
Did you have change in penile sensitivity after surgery? (%):			0.0158†
Increased sensitivity	8	14	
No change	72	5	
Decreased sensitivity	20	36	
Since surgery, have you ever experienced cold glans during erection? (%):			0.0022†
Yes	3	12	
No	91	74	
No erections	6	14	
Have you noticed changes in your ejaculation since surgery? (%):			0.2867
Improved	18	12	
No change	57	52	
Worse	25	36	

\* For MSHQ-Ej and SHIM t-test and for other questions chi-square test p values.  
 † Statistically significant (p <0.05).

cystoscopic measures, supporting our first hypothesis. Independent of cystoscopic appearance we also found that men with new postoperative sexual complaints, new or persistent urinary pain/dysuria and men reporting poor urinary quality of

life reported procedural dissatisfaction, supporting our second hypothesis. We believe that these findings emphasize the importance of including PROMs as a routine part of postoperative monitoring after urethral reconstruction when

**Table 5.** Logistic regression multivariate predictors of patient dissatisfaction for each point increase in questions most predictive of reported dissatisfaction, controlling for cystoscopic recurrence, age, BMI and followup

	OR (95% CI)
Age	1.00 (0.99–1.01)
BMI	1.04 (0.99–1.09)
Sexual activity alteration	4.36 (1.54–12.37)*
Pain:	
Urethra	1.71 (1.05–2.77)*
Bladder	2.74 (1.12–6.69)*
I-PSS total:	1.16 (1.07–1.25)*
Hesitancy	2.01 (1.29–3.13)*
Quality of life	1.96 (1.42–2.72)*
CLSS total:	1.20 (1.07–1.34)*
Urinary strain	3.23 (1.74–6.01)*
SHIM total:	1.04 (0.98–1.10)
Erection confidence	1.53 (1.12–2.07)*
MSHQ total:	1.13 (1.05–1.21)*
Inability to ejaculate	1.52 (1.15–2.01)*
Cystoscopic recurrence	4.96 (2.07–11.90)*
Followup	1.00 (0.98–1.03)

\* Statistically significant ( $p < 0.05$ ).

measuring success. These findings also suggest a role for reporting PROM results when comparing the outcomes of various urethral reconstruction techniques.

Limited studies have been done to date to specifically evaluate patient satisfaction after urethroplasty. In 2002 Kessler et al mailed questionnaires to 233 patients postoperatively, asking questions on the need for re-intervention, urinary tract infections, penile anatomical changes, erections and satisfaction.<sup>19</sup> They found high 80% overall satisfaction but in the 20 patients who reported dissatisfaction higher rates of penile curvature, erectile dysfunction and slow urinary flow were noted. More recently, Jackson et al assessed 46 men after anterior urethroplasty using a newly developed, validated PROM of their group.<sup>11</sup> Of the respondents 87% reported feeling satisfied or very satisfied with the outcome of the procedure. Other studies have shown that successful urethroplasty significantly improves urinary quality of life, which may serve as an indirect measure of satisfaction.<sup>11–13</sup>

Our study confirms the hypothesis that traditional measures of success correlate strongly with patient satisfaction. In men reporting satisfaction the cystoscopic recurrence rate was 11% vs almost 44% in men reporting dissatisfaction ( $p < 0.01$ ). Uroflowmetry findings were also significantly worse in men who were dissatisfied with lower maximum flow rates, lower average flow rates and, importantly, less improvement in flow rates from preoperative values. However, fewer than half of the 46 men who were not satisfied with the procedure demonstrated cystoscopic recurrence, meaning that historical definitions of surgical success do not

always correlate with outcomes that appear to be important to the patient.

### Patient Dissatisfaction Predictors

On our multivariate analysis we controlled for cystoscopy recurrence, BMI, followup and age, and determined independent factors associated with dissatisfaction. Significant alterations in postoperative sexual activity were strongly associated with patient dissatisfaction as demonstrated by lower postoperative overall SHIM scores and changes in SHIM scores relative to preoperative values. The SHIM question that was most strongly associated with dissatisfaction was loss of confidence to maintain erection. While the majority of urethroplasty studies show minimal lasting overall change in erectile function,<sup>20–22</sup> we found that when present, sexual dysfunction has a significant negative impact on satisfaction.

Postoperative pain was another factor strongly associated with postoperative dissatisfaction. Urethral and bladder pain was assessed using CLSS, on which dissatisfied men had significantly higher postoperative pain scores. We have previously reported the unexpectedly high 40.7% to 70.7% rate of lower urinary tract pain in the urethral stricture population, which was more pronounced in younger men.<sup>3</sup> Importantly, significant improvements in pain occur in 64% to 73.5% of these patients after successful repair. Our current series demonstrates that pain can sometimes exist/persist after successful repairs and it may also impact patient satisfaction. While we often assume that pain associated with urethral stricture disease is related to high pressure voiding and, thus, it will improve after successful urethroplasty, previously no correlation was found between postoperative uroflowmetry rates and pain.<sup>3</sup> In our study pain was an independent predictor of dissatisfaction despite controlling for age and stricture recurrence. The postoperative pain that we report may be related to the surgery and it may gradually abate further out from surgery. However, ways to minimize even short-term postoperative pain and, thus, improve patient quality of life must be considered.

Finally, the persistence of postoperative voiding complaints, as demonstrated by higher (worse) postoperative CLSS and I-PSS scores, was independently associated with dissatisfaction. Individual questions that contributed most to these scores were a slow, weak urine flow and the need to strain while urinating. Presumably, men undergo urethroplasty with the hope of improving urinary symptoms. When symptoms do not improve or do not improve as much as patients might have anticipated, dissatisfaction may ensue.

Interestingly, on multivariate analysis urine flow rates and changes in flow rates, which are historically important measures to assess urethroplasty success,<sup>7</sup> appeared to be less important than the patient perception of voiding complaints independent of flow. This further emphasizes the importance of using PROMs to elucidate what matters most to our patients.

### Study Limitations

Limitations of our study include the inability to describe specific surgical techniques that may lead to improved satisfaction as our population and surgical techniques were too heterogeneous, our subgroups were too small and our satisfaction rates were too high for an adequately powered comparison of techniques. However, univariate analysis revealed that no specific stricture location or urethroplasty type was associated with satisfaction. Thus, it appears that dissatisfaction, and the sexual dysfunction, pain and lower urinary tract complaints associated with dissatisfaction can occur with all repairs at all locations. We also did not gather data to elucidate a specific reason why a patient reported dissatisfaction.

This study was cross-sectional. Although mean followup was 14 months, we were unable to assess whether continued improvement in pain, voiding symptoms or sexual function would improve satisfaction rates with time.

Finally, while the TURNS group uses a multitude of validated questionnaires to analyze postoperative patient reported symptoms, only 1 PROM is validated specifically for urethral stricture disease,<sup>11</sup> although this PROM does not assess sexual function. Our research group is currently working to create a comprehensive PROM that will hopefully address this issue, given that we have found sexual function to be an important issue for men before and after urethral reconstruction. We await future field testing of our planned urethral stricture specific PROM to confirm the inclusion of sexual function items.

### CONCLUSIONS

Anterior urethroplasty results in high rates of patient satisfaction. This is a testament to the pioneering work of the previous reconstructive urologists who developed the refined techniques that we use today. The current study shows that while many of these procedures can produce an adequately reconstructed urethra, as shown on objective measures such as cystoscopic appearance and urinary flow rates, the patient concerns with pain, sexual function and voiding complaints can be the primary determinants of patient satisfaction. Even patients with objective evidence of recurrent stricture were more likely to be satisfied if they reported minimal pain, erectile and voiding dysfunction.

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## EDITORIAL COMMENT

In this trial urethroplasty patient satisfaction was 89%, mirroring the 90% expected technical success rate of most standard urethroplasties. Stricture recurrence implied a 500% increased chance of dissatisfaction but unhappiness after surgery also increased when voiding symptoms did not abate after surgery. If urethroplasty caused perceived erectile dysfunction, patients were 400% more likely to be unhappy. Patients complaining of sexual dysfunction were evenly matched in anastomotic vs buccal urethroplasty cohorts.

This is surprising because the literature suggests that anastomotic urethroplasty causes more sexual dysfunction than buccal urethroplasty. Morey and Kizer reported sexual dysfunction after anastomotic urethroplasty.<sup>1</sup> A whopping 44% of patients were unsatisfied, including 44% who had chordee and 22% who complained of decreased penile length. This was confirmed at lower rates in the report by

Barbagli et al (a cold/soft glans during erection in 5% of patients and decreased glans sensitivity in 7%) (reference 18 in article) and at our center (chordee in 4% and erectile dysfunction in 14%). In contrast, Palminteri et al confirmed that after buccal urethroplasty, sexual satisfaction might actually increase.<sup>2</sup>

So how do we make a happy urethroplasty patient? This is achieved through 1) technical success, 2) avoiding erectile dysfunction even to the point of avoiding anastomotic techniques when possible(?), 3) aggressively diagnosing/treating residual urinary dysfunction and 4) preparing patients thoroughly and honestly for surgery and its possible complications.

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## REPLY BY AUTHORS

We caution readers regarding the statement in the comment on erectile dysfunction risk and its relationship to surgical choice for urethral stricture. Avoid anastomotic repairs when possible? Despite the interest in the topic in the reconstructive literature, to our knowledge there have been no definitive studies to date showing that one type of surgery for anterior urethral stricture disease leads to more sexual dysfunction than another.

A recent systemic review concluded that anterior urethroplasty creates de novo erectile dysfunction in around 1% of cases and it did not identify the specific surgical risk factors responsible for increased rates of erectile dysfunction (reference 21 in article). However, the wide range of reported erectile dysfunction outcomes in the review (0% to 38%) calls into question the accuracy of the reporting, which was likely influenced by surgical selection and reporting biases, and differences in how

erectile dysfunction is recorded. Only a well performed randomized, controlled trial would settle the issue regarding erectile dysfunction and urethroplasty, something that is entirely possible as collaboration in the field becomes more common.

However, even if this randomized, controlled trial were to be performed, we must still be able to adequately weigh the (likely) low risk of erectile dysfunction with the real risk of stricture recurrence that occurs after urethroplasties of all

types. Because medium to long-term outcome studies have, with rare exceptions, reported higher success rates with anastomotic repairs vs substitution repairs,<sup>1</sup> reflexively offering substitution repairs may not be in the best interest of the patient.<sup>2</sup>

The take-home point might simply be that we still have much work to do regarding ways to optimize all determinants of patient satisfaction after urethroplasty.

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