

# UCSF

## UC San Francisco Previously Published Works

### Title

Prevalence of Post-Micturition Incontinence before and after Anterior Urethroplasty

### Permalink

<https://escholarship.org/uc/item/50v0c9ms>

### Journal

Investigative Urology, 200(4)

### ISSN

0021-0005

### Authors

Cotter, Katherine J  
Flynn, Kevin J  
Hahn, Amy E  
[et al.](#)

### Publication Date

2018-10-01

### DOI

10.1016/j.juro.2018.03.134

Peer reviewed

# Author's Accepted Manuscript



Prevalence of post-micturition incontinence before and after anterior urethroplasty

Katherine J. Cotter , Kevin J. Flynn , Amy E. Hahn , Bryan B. Voelzke , Jeremy B. Myers , Thomas G. Smith , 3<sup>rd</sup> , Sean P. Elliott , Nejd F. Alsikafi , Benjamin N. Breyer , Alex J. Vanni , Jill C. Buckley , Lee C. Zhao , Bradley A. Erickson

PII: S0022-5347(18)42972-2  
DOI: [10.1016/j.juro.2018.03.134](https://doi.org/10.1016/j.juro.2018.03.134)  
Reference: JURO 15559

To appear in: *The Journal of Urology*  
Accepted Date: 31 March 2018

Please cite this article as: Cotter KJ, Flynn KJ, Hahn AE, Voelzke BB, Myers JB, Smith TG3rd, Elliott SP, Alsikafi NF, Breyer BN, Vanni AJ, Buckley JC, Zhao LC, Erickson BA, Prevalence of post-micturition incontinence before and after anterior urethroplasty, *The Journal of Urology*® (2018), doi: 10.1016/j.juro.2018.03.134.

**DISCLAIMER:** This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our subscribers we are providing this early version of the article. The paper will be copy edited and typeset, and proof will be reviewed before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to The Journal pertain.

## Embargo Policy

**All article content is under embargo until uncorrected proof of the article becomes available online.**

We will provide journalists and editors with full-text copies of the articles in question prior to the embargo date so that stories can be adequately researched and written. The standard embargo time is 12:01 AM ET on that date. Questions regarding embargo should be directed to [jumedia@elsevier.com](mailto:jumedia@elsevier.com).

**Prevalence of post-micturition incontinence before and after anterior urethroplasty**

Katherine J. Cotter<sup>1</sup>, Kevin J. Flynn<sup>1</sup>, Amy E. Hahn<sup>1</sup>, Bryan B. Voelzke<sup>2</sup>, Jeremy B. Myers<sup>3</sup>,  
Thomas G. Smith 3<sup>rd4</sup>, Sean P. Elliott<sup>5</sup>, Nejd F. Alsikafi<sup>6</sup>, Benjamin N. Breyer<sup>7</sup>, Alex J. Vanni<sup>8</sup>, Jill  
C. Buckley<sup>9</sup>, Lee C. Zhao<sup>10</sup>, Bradley A. Erickson<sup>1</sup>

<sup>1</sup>Department of Urology, University of Iowa, Iowa City, IA

<sup>2</sup>University of Washington, Seattle, WA

<sup>3</sup>University of Utah, Salt Lake City, UT

<sup>4</sup>Baylor College of Medicine, Houston, TX

<sup>5</sup>University of Minnesota, Minneapolis, MN

<sup>6</sup>Uropartners, Gurnee, IL

<sup>7</sup>University of California, San Francisco, San Francisco, CA

<sup>8</sup>Lahey Hospital and Medical Center, Burlington, MA

<sup>9</sup>University of California, San Diego, San Diego, CA

<sup>10</sup>New York University, New York, NY

**Abstract**

**PURPOSE:** This study aims to define the prevalence of pre- and post-operative post-micturition incontinence, or post-void dribbling, after anterior urethroplasty for urethral stricture disease and to determine risk factors for its presence.

**METHODS:** A retrospective review of a prospectively maintained, multi-institutional urethral stricture database was performed to evaluate PMI utilizing a single question from a validated questionnaire: "How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself?" (Never (0) - All the Time (4)). Presence of PMI was defined as any answer  $> 0$ , and comparisons were made to stricture type, location, repair type, and patients' medical co-morbidities.

**RESULTS:** Pre- and post-operative PMI questionnaires were completed by 614 and 331 patients, respectively. Patients without complete data were excluded. Pre-operative PMI was present in 73% of patients, of which 44% stated this symptom was present "most of the time". Overall post-operative PMI was present in 40%, again not predicted by stricture location or urethroplasty type. Of the 331 patients with follow-up questionnaires, 60% reported improvement, 32% were unchanged, and 8% reported worsening symptoms. The overall rate of de novo PMI was low at 6.3%.

**CONCLUSIONS:** The prevalence of pre-operative PMI is high and likely under reported. Most patients' PMI improves after urethroplasty, and the prevalence of de novo PMI is low. The presence of PMI was not predicted by stricture length, location, or urethroplasty repair type.

## Introduction

Post-micturition incontinence (PMI), or post-void dribbling, is a lower urinary tract symptom that negatively affects quality of life in men, with a reported prevalence of nearly 30%<sup>1</sup>. PMI rates increase with age, thought to reflect slower transit of urine through the urethra secondary to prostatic growth, bladder dysfunction, and potentially, an age-dependent decrease in contractility of the bulbospongiosus muscle<sup>2</sup>. During micturition, electromyography studies have demonstrated that urine passage is aided by dynamic interaction with and mild contraction of this muscle via the urethro-cavernosus reflex<sup>3</sup>.

PMI is a common complaint after anterior urethroplasty, with a recent study reporting rates of bothersome PMI between 17 and 23% depending on the repair type<sup>4</sup>. As anterior urethral reconstruction generally requires manipulation/splitting of the bulbospongiosus muscle, post-operative muscle dysfunction and neuropraxia have been postulated mechanisms. In addition, the utilization of graft material during the urethroplasty, which is often fixed to the surrounding tissue to promote vascularization, effectively inhibits the normal, physiologic expansion and contraction of the urethra, creating a reservoir effect within the urethra and resulting in incontinence.

While PMI is generally thought to be a consequence of urethral reconstruction, the contribution that the stricture itself has on PMI is mostly unknown. As PMI is also a common presenting symptom of urethral stricture disease, thought to be secondary to the urine that remains trapped proximal to the stricture after voiding, the true impact of urethroplasty cannot be fully understood without longitudinal studies..

The purpose of this present study was to evaluate the impact that urethral reconstruction has on post-micturition incontinence in men presenting with anterior urethral stricture disease. We hypothesize that PMI will improve after a successful urethroplasty, though to a lesser degree when grafts are utilized in the repair.

ACCEPTED MANUSCRIPT

## Methods

A retrospective review of a prospectively maintained, IRB approved, multi-institutional urethroplasty database was analyzed for all adult male patients with anterior urethral stricture disease who underwent urethroplasty. Urethral strictures were classified as either bulbar or penile based on pre-operative retrograde urethrogram, and stricture length was specified in centimeters. For the purposes of this study, patients with strictures spanning both the penile and bulbar urethra were classified and analyzed in the penile stricture cohort. Additional patient criteria included age, body mass index, history of intermittent catheterization, and significant medical history, including hypertension and diabetes mellitus. Urethroplasty repair type was determined at the discretion of the surgeon and was categorized as anastomotic repair, which included both excision and primary anastomosis (EPA) and non-transecting excision and primary anastomosis, substitution urethroplasty with dorsal or ventral buccal mucosa graft, or other. The final classification consisted of patients that underwent fasciocutaneous flaps, urethral diverticulum repair, and/or extended meatotomy without concomitant EPA or urethroplasty with buccal graft.

All patients were included that had answered the following question on a previously validated urethroplasty questionnaire both pre- and post-operatively: "How often have you had a slight wetting of your pants a few minutes after you had finished urinating and had dressed yourself?" (Never (0) – Most of the Time (3)). These questionnaires were distributed prior to surgery. Post-operative, standardized questionnaires were completed between 3 and 6 months after surgery and generally corresponded with a same-day cystoscopy and/or uroflowmetry to confirm urethral patency. The standard follow-up was at 3 and 12 months post-operatively.

The presence of post-micturition incontinence was defined as any answer to the validated question  $> 0$ . Post-operative improvement in PMI was defined by any decrease in score relative to pre-operative score, whereas worsening was defined as a higher post-operative score.

The primary analysis was the overall difference in rate of PMI score after successful anterior urethroplasty, which was analyzed using a Student's T-test for difference in means for continuous variables and a chi-square test for difference in proportions for categorical variables. Analysis was performed and odds ratios calculated for the full model, which included stricture length, age, BMI, stricture location, presence of diabetes, hypertension, and history of intermittent catheterization. Secondary subanalyses were then performed to analyze how stricture location, stricture length, urethroplasty type, and patient demographics, including age and BMI, affected PMI. A generalized linear model for binary outcome was fit to determine multivariate effects.



## Results

There were 614 patients in the Trauma and Urologic Reconstruction Network of Surgeons (TURNS) database that completed pre-operative questionnaires and 331 (52%) patients completed both pre- and post-operative questionnaires. The cohort patient demographics are shown in Table 1. Notably, with the exception of stricture length (3.24 cm vs. 3.52 cm;  $p = 0.01$ ), stricture characteristics and patient demographics did not differ between those patients with and without post-operative questionnaires.

Pre-operative PMI was present in 73% of patients, of which 44% stated it was present “most of the time.” Stricture characteristics were unable to predict for pre-operative PMI. BMI was the only pre-operative predictor for PMI, with the odds of PMI increasing 4% for each BMI point (Table 2).

Post-operative PMI was present in 40% of patients, of which 11% stated it was present “most of the time.” On univariate analysis (Table 3), repair type and location did not affect the rate of post-operative PMI, with rates ranging from 32.8% to 43.5% ( $p=0.647$ ). BMI was protective of post-operative PMI (Table 4).

Of patients with pre-operative PMI, 60% reported post-operative improvement, 32% reported stable PMI, and 8% were worse (Figure 1). Of the 82 patients without pre-operative PMI, 21 (26%) reported new onset PMI. There were 20 men (6%) that had cystoscopic recurrence of their urethral stricture. Of these men, only 1 out of 20 (5%) had de novo PMI.

## Discussion

The purpose of the current study was to evaluate the prevalence of post-micturition incontinence (PMI) both prior to and after anterior urethroplasty. Our hypothesis was that PMI would improve overall following urethral reconstruction. We also hypothesized that the use of grafts during urethroplasty would lead to a lower improvement rate in PMI due to effects on physiologic urethral functioning and contractility. Our results supported the hypothesis that PMI generally improves after urethroplasty and demonstrated a significant improvement in patient-reported PMI in the post-operative versus pre-operative period. The use of grafts, however, was not associated with a higher rate of PMI post-operatively regardless of the graft location. Overall, very few (6.3%) patients developed de novo PMI after surgery.

The importance of patient-reported outcome measures (PROMs) after reconstructive surgery has previously been described<sup>5,6</sup>. While clinician measures of success often focus upon purely objective end points (e.g., change in maximum flow rate, time to recurrence, need for additional surgical procedures), results from these validated questionnaires are closely associated with patient satisfaction after surgery<sup>7</sup>. Most early studies on the voiding dysfunction associated with urethral stricture disease used the AUA symptom score to evaluate PROMs<sup>8,9</sup>. However, we have found that post-micturition incontinence is a key question that distinguishes currently utilized, urethroplasty-specific questionnaires, and it remains a symptom that patients regard as important and significant in quality of life<sup>6</sup>.

While the prevalence of PMI following urethroplasty has been described as up to 30% in prior evaluations<sup>1</sup>, this study found an even higher prevalence of this symptom than has previously been described. This result may be partially attributed to the fact that the questionnaire described in 2011 by Jackson et al<sup>4</sup> used allows a graded, rather than an absolute “yes” or “no”

scale, and all answers greater than “no”/0 (regardless of severity) were treated as a positive response. Many prior reports did not query patients with this level of detail. This is both a potential limitation and a benefit to this study in that it quantifies the severity of a positive response.

Our findings indicate the widespread prevalence of PMI in untreated urethral stricture patients and highlight the importance of obtaining pre-operative voiding function and quality of life assessments, which can then serve as a marker for comparison upon completion of post-operative questionnaires. While the overall prevalence remained relatively high at 40% after surgery, even in those patients reporting some degree of PMI, the severity of symptoms decreased. A significantly lower proportion (11%) of patients reported “all the time” in response to the PMI-specific question after urethroplasty. The use of grafts, however, was not associated with a higher rate of PMI post-operatively and all urethroplasties, regardless of location, length and repair type, had similar rates of post-operative PMI. From our data, PMI appears to improve, not worsen, following urethroplasty, which translates to a greater chance for patient-reported satisfaction after surgery.

Additional limitations to this study include its retrospective nature, as well as a limited sample size due to the number of patients that did not complete post-operative questionnaires. While the initial pre-operative questionnaire data was complete in the majority of patients, our analysis was limited as those without complete data were excluded. Also, patients lost to follow-up may introduce a source of bias in the remaining cohort in that those who did complete questionnaires may have done so as a consequence of largely positive or negative outcomes. We also did not control our PMI analysis for other lower urinary tract symptoms, sexual dysfunction or surgical satisfaction. While these associations likely exist, for this particular study, we elected to study PMI in isolation as it is a novel analysis, it likely changes in a collinear fashion with these other

symptoms, and post-operative changes in these symptoms have already been studied extensively by this group and others<sup>10-13</sup>. Future studies should aim for a greater proportion of patients with complete questionnaire data regardless of post-operative outcomes.

## **Conclusions**

The overall prevalence of post-micturition incontinence decreases and the severity improves significantly after anterior urethroplasty for urethral stricture disease. While PMI rates are still relatively high, there are very few patients in which urethroplasty leads to new onset PMI irrespective of stricture location and repair type, a finding that is opposite of conventional wisdom. These findings are important both for pre-operative counseling and informed consent purposes but also in determining patient-centered success rates after urethroplasty.

## References

1. Fredrick A, Erickson BA, Stensland K, et al. Functional Effects of Bulbospongiosus Muscle Sparing on Ejaculatory Function and Post-Void Dribbling after Bulbar Urethroplasty. *J Urol*. 2017 Mar;197(3 Pt 1):738-743.
2. Feneley, R.C.L. (1986) Post-micturition dribbling. In: Mandelstam, D. (ed). *Incontinence and its Management*. London: Croom Helm.
3. Shafik A, Shafik IA, El Sibai O, et al. Study of the response of the penile corporal tissue and cavernosus muscles to micturition. *BMC Urol*. 2008 Mar 2;8:4. doi: 10.1186/1471-2490-8-4.
4. Coyne KS, Sexton CC, Thompson CL, et al. The prevalence of lower urinary tract symptoms (LUTS) in the USA, the UK and Sweden: results from the Epidemiology of LUTS (EpiLUTS) study. *BJU Int*. 2009;104:352.
5. Jackson MJ, Sciberras J, Mangera A, et al. Defining a patient-reported outcome measure for urethral stricture surgery. *Eur Urol*. 2011 Jul;60(1):60-8.
6. Jackson MJ, Chaudhury I, Mangera A, et al. A prospective patient-centred evaluation of urethroplasty for anterior urethral stricture using a validated patient-reported outcome measure. *Eur Urol*. 2013 Nov;64(5):777-82.
7. Kessler TM, Fisch M, Heitz M, et al. Patient satisfaction with the outcome of surgery for urethral stricture. *J Urol*. 2002; 167: 2507-2511.
8. Morey AF, McAninch JW, Duckett CP, et al. American Urological Association symptom index in the assessment of urethroplasty outcomes. *J Urol*. 1998;159:1192-1194.
9. Heyns CF, Marais DC. Prospective evaluation of the American Urological Association symptom index and peak urinary flow rate for the followup of men with known urethral stricture disease. *J Urol* .2002;168:2051-2054.
10. Hampson LA, Elliott SP, Erickson BA, et al. Multicenter Analysis of urinary urgency and urge incontinence in patients with anterior urethral stricture disease before and after urethroplasty. *J Urol*. 2016 Dec;196(6):1700-1705.
11. Erickson BA, Granieri MA, Meeks JJ, et al. Prospective Analysis of Ejaculatory Function After Anterior Urethral Reconstruction. *J Urol*. 2010 Jul;184(1):238-42.
12. Johnson EK, Latini JM. The impact of urethroplasty on voiding symptoms and sexual function. *Urology*. 2011 Jul;78(1):198-201.

13. Lucas ET, Koff WJ, Rosito TE, et al. Assessment of satisfaction and Quality of Life using self -reported questionnaires after urethroplasty: a prospective analysis. *Int Braz J Urol.* 2017 Mar-Apr;43(2):304-310.

ACCEPTED MANUSCRIPT

**Table 1.** Pre-operative PMI – Univariate

	<b>Overall (n= 331)</b>	<b>PMI + (n = 249)</b>	<b>PMI - (n = 82)</b>	<b>p-value</b>
<b>Stricture Length (cm)</b> mean (sd)	3.24 (2.45)	3.31 (2.52)	3.02 (2.21)	0.32
<b>Location n (%)</b>				0.72
<b>Penile</b>	100 (0.30)	77 (0.31)	23 (0.28)	
<b>Bulbar</b>	231 (0.70)	172 (0.69)	59 (0.72)	
<b>Age (years)</b>	44.61 (16.29)	44.75 (16.32)	44.16 (16.27)	0.77
<b>BMI (kg/m<sup>2</sup>)</b>	29.93 (7.08)	30.17 (7.30)	29.53 (6.26)	0.44
<b>Diabetes</b>	36 (0.11)	25 (0.10)	11 (0.13)	0.52
<b>Hypertension</b>	96 (0.29)	66 (0.27)	30 (0.37)	0.11
<b>History of Intermittent Catheterization</b>	65 (0.20)	51 (0.20)	14 (0.17)	0.61

**Table 2.** Pre-operative PMI – Multivariate

	<b>OR (Controlled for age only)</b>	<b>95%CI</b>	<b>OR (Full model*)</b>	<b>95%CI</b>
<b>Length (cm)</b>	1.00	(0.94, 1.06)	1.00	(0.94, 1.07)
<b>Age (years)</b>	1.00	(0.99, 1.01)	1.00	(0.99, 1.01)
<b>BMI (kg/m<sup>2</sup>)</b>	1.04	(1.01, 1.07)	1.04	(1.01, 1.07)
<b>Location: penile as opposed to bulbar</b>	1.15	(0.78, 1.72)	1.13	(0.76, 1.70)
<b>Diabetes</b>	0.93	(0.53, 1.69)	1.02	(0.57, 1.89)
<b>Hypertension</b>	0.79	(0.52, 1.22)	0.77	(0.50, 1.21)
<b>History of Intermittent Catheterization</b>	1.23	(0.77, 2.02)	1.24	(0.77, 2.04)

\*Full model included all variables listed in column 1



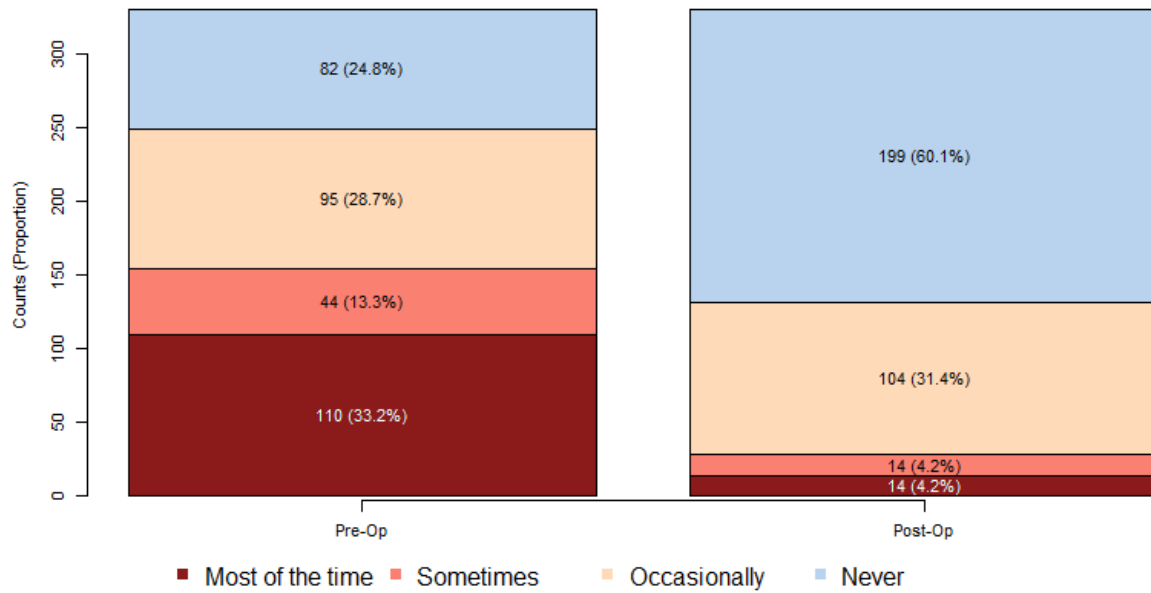
**Table 3.** Post-operative post-micturition incontinence

Repair Type	Overall (n = 331)	PMI + (n = 132)	PMI - (n = 199)	p-value
<b>EPA</b>	140	57 (40.7%)	83 (59.3%)	0.647
<b>Dorsal Graft</b>	69	30 (43.5%)	39 (56.5%)	
<b>Ventral Graft</b>	64	26 (40.6%)	38 (59.4%)	
<b>Other</b>	58	19 (32.8%)	39 (67.2%)	

**Table 4.** Post-operative PMI – Multivariate

	<b>OR (Controlled for age only)</b>	<b>95% CI</b>	<b>OR (Full model)</b>	<b>95% CI</b>
<b>Length (cm)</b>	1.03	(0.94, 1.12)	1.04	(0.93, 1.16)
<b>Age (years)</b>	1.00	(0.99, 1.02)	1.00	(0.99, 1.02)
<b>BMI (kg/m<sup>2</sup>)</b>	0.96	(0.93, 0.99)	0.96	(0.93, 1.00)
<b>Location: penile as opposed to bulbar</b>	0.95	(0.58, 1.53)	0.96	(0.59, 1.57)
<b>Diabetes</b>	0.71	(0.33, 1.46)	0.65	(0.29, 1.38)
<b>Hypertension</b>	1.17	(0.69, 1.99)	1.27	(0.73, 2.21)
<b>History of Intermittent Catheterization</b>	1.07	(0.61, 1.88)	1.05	(0.59, 1.86)
<b>Repair Type</b>				
<b>EPA compared to other</b>	1.44	(0.76, 2.79)	1.60	(0.79, 3.37)
<b>Ventral Graft compared to other</b>	1.41	(0.67, 2.98)	1.38	(0.65, 2.95)
<b>Dorsal Graft compared to other</b>	1.58	(0.77, 3.30)	1.53	(0.73, 3.23)

## Distribution of Post-Void Dribbling Scores



**Figure 1.** Distribution of pre-and post-operative post-micturition incontinence scores

Abbreviations

BMI: Body mass index

CI: Confidence interval

EPA: Excision and primary anastomosis

OR: Odds ratio

PMI: Post-micturition incontinence

ACCEPTED MANUSCRIPT