Title
Assessment of the Male Urethral Reconstruction Learning Curve

Authors
Faris, Sarah F
Myers, Jeremy B
Voelzke, Bryan B
et al.

Publication Date
2016-03-01

DOI
10.1016/j.urology.2015.11.038

Peer reviewed

Assessment of the Male Urethral Reconstruction Learning Curve

Sarah F. Faris, Jeremy B. Myers, Bryan B. Voelzke, Sean P. Elliott, Benjamin N. Breyer, Alex J. Vanni, Christopher A. Tam, and Bradley A. Erickson for the Trauma and Urologic Reconstruction Network of Surgeons (TURNS)

OBJECTIVE To evaluate the urethroplasty learning curve. Published success rates of urethral reconstruction for urethral stricture disease are high even though these procedures can be technically demanding. It is likely that success rates improve with time although a learning curve for urethral reconstruction has never been established.

MATERIALS AND METHODS We retrospectively reviewed anterior urethroplasties from a prospectively maintained multi-institutional database. Success was analyzed at the 18-month mark in all patients and defined as freedom from secondary operation for stricture recurrence. A multivariate logistic regression was performed for outcomes vs time from fellowship and case number.

RESULTS A total of 613 consecutive cases from 6 surgeons were analyzed, with a functional success rate of 87.3%. The success rate for bulbar urethroplasties was higher than that for penile urethroplasties (88.2% vs 78.3%, $P = .0116$). The success rate of anastomotic repairs was higher than that for substitution repairs (95.0% vs 82.4%, $P = .0001$). There was a statistically significant trend toward improved outcomes with increasing number of cases ($P = .0422$), which was most pronounced with bulbar repairs. There was no statistical improvement in penile repairs over time. The case number to reach proficiency (>90% success) was approximately 100 cases for all types of reconstruction and 70 cases for bulbar urethroplasty. There were statistical differences in success rates among the participating surgeons ($P = .0014$). Complications decreased with time ($P = .0053$).

CONCLUSION This study shows that success rates of anterior urethral reconstruction improve significantly with surgeon experience. Proficiency occurs after approximately 100 cases. UROLOGY 89: 137–143, 2016. Published by Elsevier Inc.

Urethroplasty is considered the gold standard treatment for urethral stricture disease with procedure- and location-dependent success rates ranging from 75% to 99%.[1-3] Despite the high success rates, urethroplasty is a technically demanding operation in which no single type of urethroplasty can be utilized for all types of strictures. As with other complex procedures, both technical and clinical expertise are required before high success rates can be achieved, implying that a significant learning curve likely exists.

Overall utilization of urethroplasty for urethral stricture disease in the United States is low, but with an increase in studies showing both the clinical and cost-effective superiority of urethroplasty as compared with urethrotomy or dilation, the rates of urethroplasty are expected to rise.[4-9] An additional factor in utilization rates will likely come from the expanded number of reconstructive urologic fellowship programs currently available to graduating residents, which will increase the exposure of the majority of recently trained urologists to urethral reconstruction.[10]

The purpose of this study was to analyze the early surgical outcomes from a group of recently trained reconstructive urologic fellows in order to generate a learning curve and to provide an estimate of the number of cases needed to reach surgical proficiency. We hypothesized that urethroplasty outcomes would improve with the number of urethroplasty cases performed over time.

MATERIALS AND METHODS

Study Population

We examined surgical success in consecutive patients who underwent anterior urethroplasty by 6 surgeons who are members of the Trauma and Urologic Reconstruction Network of Surgeons (TURNS). Patients with at least 18 months of objective postoperative follow-up were included. We reviewed the surgical records from a prospective (from years 2009 to present) and

Financial Disclosure: *The authors declare that they have no relevant financial interests.*

From the Department of Urology, Carver College of Medicine, University of Iowa, Iowa City, IA; the Division of Urology, University of Utah, Salt Lake City, UT; the Department of Urology, University of Washington, Seattle, WA; the Department of Urology, University of Minnesota, Minneapolis, MN; the Department of Urology, University of California, San Francisco, CA; and the Department of Urology, Lahey Clinic, Burlington, MA

Address correspondence to: Bradley A. Erickson, M.D., M.S., Department of Urology, Carver College of Medicine, University of Iowa, 3233 Roy Carver Pavillion, Iowa City, IA 52242. E-mail: brad-erickson@uiowa.edu

Submitted: August 18, 2015, accepted (with revisions): November 3, 2015

retrospective (from years prior to 2009) database for surgical outcomes after anterior urethroplasty with cases starting from immediately after fellowship training to present. Institutional review board approval was obtained for this study at each site. All patients who underwent urethroplasty after June of 2009 were enrolled in a TURNS-specific follow-up protocol described previously.[11]

Primary and Secondary Outcomes

The primary outcome was functional stricture recurrence which was defined as recurrence of the urethral stricture at the site of the previous repair that required any secondary operation, including formal urethral dilation, urethrotomy, or repeat urethroplasty within the first 18 months after their initial procedure. Recurrences after 18 months were not considered. Follow-up time was calculated as the elapsed time from surgery to date of last contact with patient in which objective (cystoscopy, uroflowmetry) or subjective (questionnaire) data were recorded.

Secondary outcomes such as operative blood loss and the presence of postoperative complications were analyzed by dichotomous yes or no for presence of any complication. Complications that were prospectively recorded included deep vein thrombosis, myocardial infarction, pulmonary embolus, postoperative hematoma, wound infection (defined as need for new antibiotic treatment), urinary tract infection (symptomatic including epididymo-orchitis and prostatitis), postoperative urethra-cutaneous fistula, and lower and upper extremity neurological complaints.

Statistical Analysis

Surgeon-specific and overall group success rates were analyzed over time by groups of 10 cases. Trends in success rates for all cases and then by subgroup, including stricture location (penile, bulbar) and repair type (excisional, substitution), were analyzed using a Cochran-Armitage Trend Test (SAS version 9.3; Cary, NC). We evaluated differences in overall recurrence rates between surgeons with a chi-squared test. We compared success rates between surgery type and stricture location using a *t*-test. Finally, we used logistic regression to evaluate the individual effects of both time from fellowship (in months) and number of total cases performed since fellowship (by 10 cases) on stricture recurrence rates and postoperative complications. For all tests, a P value <.05 determined statistical significance.

RESULTS

Overall Outcomes

A total of 613 anterior urethroplasties were analyzed from the 6 study surgeons. The total cases analyzed per surgeon averaged 102 (range 42-200). The average number of cases performed per surgeon per year averaged 21.8 (range 14-53), which increased significantly with years in practice (P = .0036). The average time from fellowship of case performance was 2.2 ± 1.2 years (range 0-5.2 years). Average stricture length did not differ significantly over time (all P values for trend were >0.05) by location (bulbar 2.8 ± 1.2 cm; penile 4.2 ± 2.5) or by type of repair (excisional 1.4 ± 1.2 cm; buccal 3.2 ± 2.8).

The overall functional success rate was 87.3% with individual surgeon success rates ranging between 80.3% and 92.7%. The success for bulbar repairs was significantly higher at 88.2% (range 83.9-98.6%) than for penile repairs at 78.3% (range 61.5-90.9%) (P = .0116). The success for anastomotic repairs was significantly higher at 95.0% (range 88.2-100%) than for substitution repairs at 82.4% (range 76.2-96.5%) (P = .0001). Case mix (ie percentage of anastomotic vs substitution) did not change with years in practice. Controlling for stricture location, years out of fellowship, and repair type, success rates between surgeons were statistically different (P = .0014). The overall complication rate was 15% (n = 74), the most common complication being urinary tract infection (4%).

Success Rates Over Time

Overall success rates improved significantly with time (P = .0422 for trend), with improvements being most pronounced with bulbar urethroplasties (Figs. 1–3). Overall success rates for penile repairs did not appear to improve with time (Fig. 2).

Defining proficiency as a success rate of >90%, this group of surgeons averaged approximately 100 cases before obtaining proficiency for all types of urethroplasty (Fig. 1). When only bulbar urethroplasties were analyzed, it required approximately 70 cases. Proficiency for excisional repairs occurred immediately after fellowship (ie >90% success was achieved within the first 10 cases) although continued to improve with time. An overall success rate of >90% was never achieved for penile urethroplasties (Fig. 2) during the study period.

Logistic regression revealed significant decreases in the odds of recurrence with both time from fellowship and in the number of cases performed after fellowship (Table 1). Notably, there was a 4% decrease (odds ratio [OR] 0.96) in the odds of secondary procedures for bulbar cases for every month out of fellowship and an 18% decrease for every 10 bulbar cases performed. For nonexcisional cases (ie buccal graft, penile flap in all locations), the odds of secondary procedures decreased by 18% (OR 0.82) for every 10 cases performed after completion of fellowship.

The odds of complications decreased by 3% (OR 0.97) and 4% (OR 0.96) for every month out of fellowship for bulbar and penile cases, respectively. Blood loss did not appear to be affected by time from fellowship or case number.

DISCUSSION

The purpose of this study was to analyze the outcomes of urethroplasty among academic urologists who recently completed a reconstructive urologic fellowship. In doing so, we generated a learning curve, which revealed improved success rates with an increase in case numbers and a decrease in complication rates with time out from fellowship. We arbitrarily defined proficiency as a functional success rate of >90% (an often quoted success rate in clinical practice) and estimated that the average number of anterior urethroplasties needed to reach proficiency was approximately 100 cases after a reconstructive urologic fellowship. To our knowledge, this is the first study to address the learning curve for urethral reconstruction.

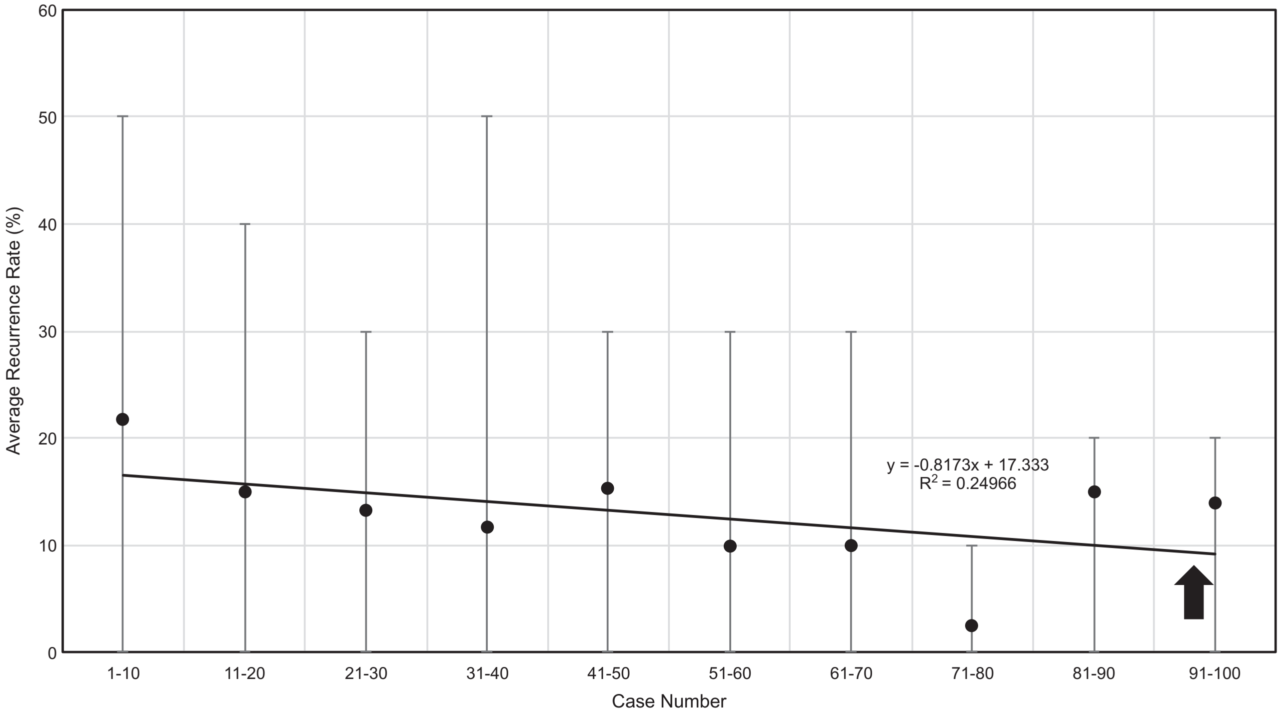

Figure 1. Figure dots represent the average recurrence rates by case volume (in blocks of 10 cases) of the 6 surgeons participating in the study. The vertical bars represent the recurrence rate range among study surgeons. Regression line and formula depicts calculated learning curve. The black arrow represents the number of cases required for the group to reach proficiency, defined as a success rate >90%.

The learning curves for other urologic procedures have been addressed before, most notably with robotic-assisted laparoscopic prostatectomy (RALP). In a study by Herrell et al, the number of cases it took for an experienced open prostate surgeon to reach surgical proficiency with RALP, defined as oncologic and functional outcomes equaling open surgery, was 150.[12] A study of RALP outcomes from newly trained laparoscopic fellows reported that outcomes were significantly improved in each of the study surgeon's second 30 cases, compared with their first 30 cases out of fellowship.[13] A similar study by Zorn et al also noted a significant learning curve and emphasized the importance of having the assistance of an experienced surgeon available during these early cases.[14]

Overall, the vast majority of urologic learning curve studies show that for complex operations, improvement in outcomes continues even beyond 100 cases. These findings are consistent across surgical fields as demonstrated in a colorectal study that attempted to determine when surgeons performing hand-assisted laparoscopic colon and rectal surgery transitioned from their "learning curve" to their "skilled period". This study estimated that the transition occurred at approximately 105 cases—and furthermore, outcomes continued to improve beyond this number.[15]

Fewer studies have addressed learning curves for reconstructive urologic procedures. A study assessing the learning curve of pediatric urologists performing tubularized incised plate hypospadias repairs utilized freedom from postoperative complications (eg fistulas, meatal stenosis, meatal coronal migrations) as a marker of success, and reported that success rates stabilized after 50-75 cases and continued to decrease even after 250 cases.[16] The learning curve for laparoscopic pyeloplasties, utilizing functional (patient reported pain) and radiographic success rates, appears to range from 20 to 50 cases.[17]

The overall functional success rate in our study analyzing urethral reconstruction for urethral stricture disease was 87.3%. When this rate was stratified by stricture location, we noted that success with bulbar repairs was significantly higher than with penile repairs, which is consistent with previously published literature.[1] Furthermore, the learning curve was steeper for bulbar repairs with a significant improvement in outcomes earlier in one's career, whereas penile repair success rates remained flat, perhaps reflecting the fewer number performed overall, providing less opportunity for improvement, or simply, that the procedure is inherently more difficult. The improvement seen with overall repairs over time likely reflects three complementary factors: (1) in many cases, the newly graduated fellows were entering geographic areas in which reconstructive surgeons had not been previously available, meaning the complexity of the cases might have been higher and worse outcomes might be expected; (2) improved surgical technique and tissue handling—that is, a true surgical learning curve; and (3) improved patient selection and selection of the appropriate surgical technique.

The findings from this study have potential clinical and policy implications. Globally, urethral stricture disease is

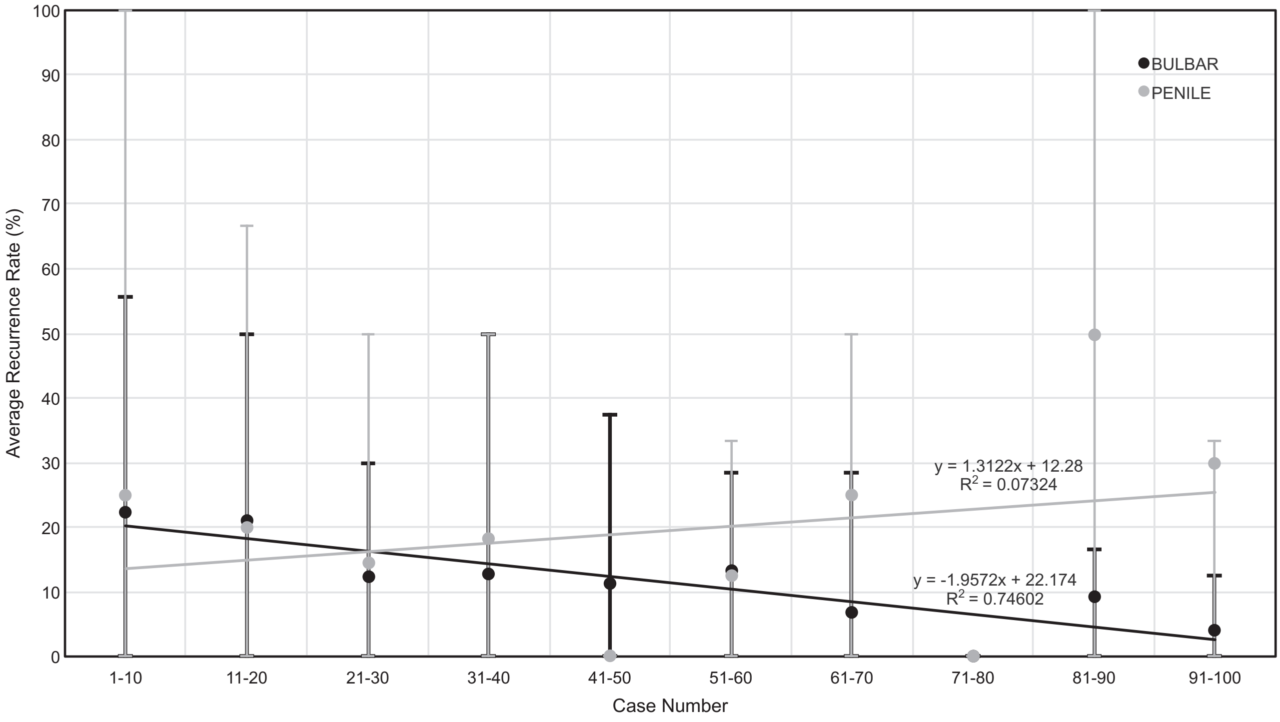

Figure 2. Figure dots represent the average recurrence rates of the 6 surgeons participating in the study by stricture location (bulbar in black; penile in gray). The average recurrence rate by location for each surgeon was determined by taking the bulbar and penile cases from each overall block of 10 cases. These rates were then averaged among the 6 surgeons. The vertical bars represent the range of recurrence rates among study surgeons. Regression line and formula depict calculated learning curve by location. The arrow represents the number of overall cases that the group required to reach proficiency for each location, defined as a success rate >90% (note: no arrow is seen for penile repairs as a success rate of 90% was not achieved).

undertreated. A study by Bullock et al evaluating the national practice pattern for urethral strictures found that the majority of urologists do not perform urethroplasties in their practice yet the average urologist treats 6-20 urethral strictures yearly. Despite a success rate of only 32% for initial endoscopic management with direct visual internal urethrotomy or dilation,[7] Bullock et al also found that 74% of urologists erroneously believe that the literature supports performing urethroplasty only after repeated failure of endoscopic methods. Of the 42% of urologic surgeons who performed urethroplasty, the average number of cases was <5 per year and only 4% of urologists performed substitution repairs (eg buccal, fasciocutaneous flap). Furthermore, only 20-29% of urologists would refer refractory strictures to another urologist and instead 31-33% would continue to manage a recurrent stricture by minimally invasive means.[4] These practice patterns likely contribute to the underuse of urethroplasty with national rates in the Bullock study of only <1%, which have only slightly increased to 4% in a more recent practice patterns study by Liu et al.[5,18] Younger urologists, likely more comfortable with urethroplasty as more fellowship-trained urologists populate academic centers, may be helping to change the stricture treatment paradigm for the better.

Given that few urologists are performing substitution repairs, proficiency with more complex repairs may never be achieved with the typical stricture volumes in nonreferral practices. If we can extrapolate the findings from our study to the paper of Bullock, it would imply that for the average urologist performing urethroplasties, it would take nearly 20 years in practice to reach clinical proficiency (success >90%). Additionally, the learning curve may be further hindered by a lack of repetition and prolonged time interval between cases. However, it has been found that patients were more likely to receive a urethroplasty if they lived in an area with a reconstructive urologist, if their urologist was newly trained, and in states with residency programs.[6,19] We are training more urologists in urethral reconstruction through residency and fellowships which should help to disseminate knowledge and bring reconstructive urologists to underserved areas.

Another finding from our study with potential clinical and educational implications was the difference in success rates noted between surgeons. Despite the group's similar fellowship training background, it can be assumed that not all surgeons in the study will manage a particular stricture using the same approach (ie some may prefer dorsal vs ventral grafts or no grafts at all). Although this study was not designed to compare surgical techniques, the difference in success rates between the surgeons in the group suggests both a need and an opportunity for continued postfellowship training for reconstructive urologists. As

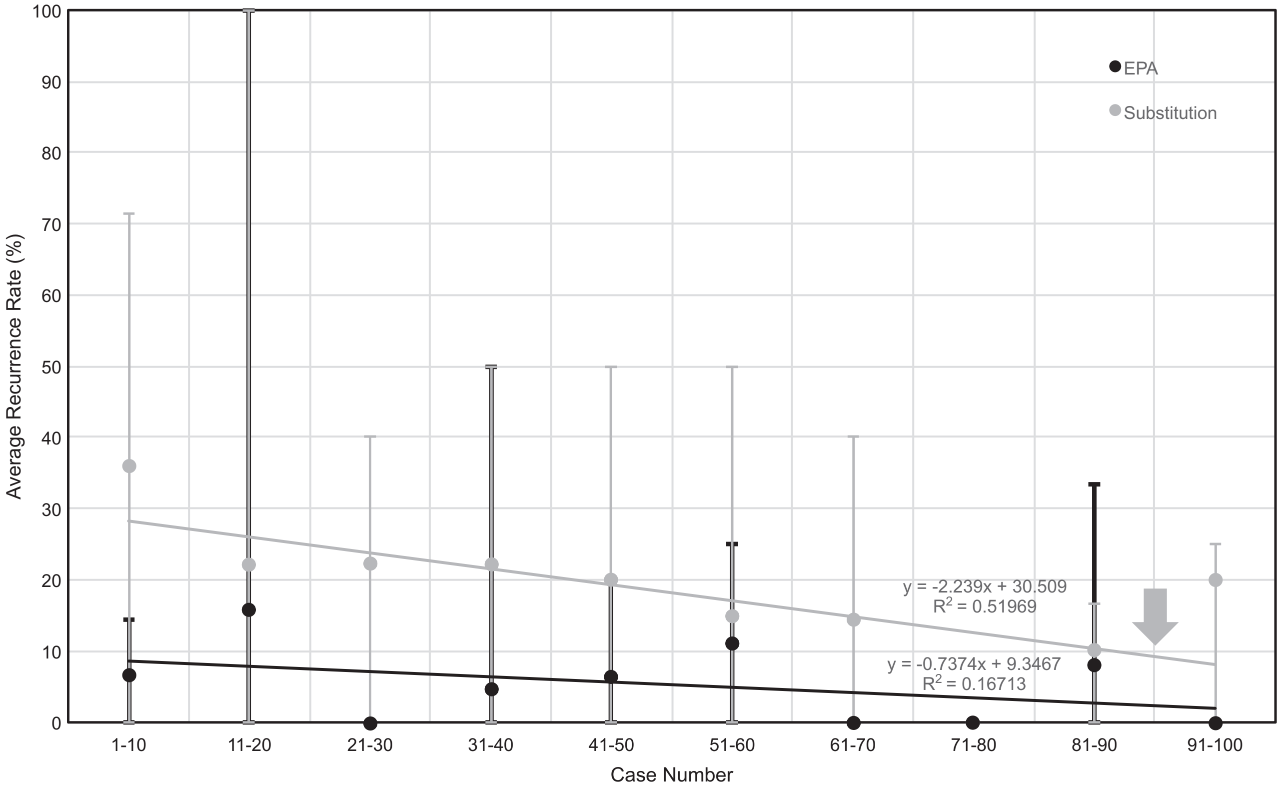

Figure 3. Figure dots represent the average recurrence rates by case volume (in blocks of 10 cases) of the 6 surgeons participating in the study by type of repair (excision and primary anastomosis in black, substitution in gray). The average recurrence rate by type of repair for each surgeon was determined by taking the anastomotic and substitution cases from each overall block of 10 cases. These rates were then averaged among the 6 surgeons. The vertical bars represent the range of success recurrence rates among study surgeons. Regression line and formula depict calculated learning curve by type of repair. The arrow represents the number of overall cases that the group required to reach proficiency for each type of repair, defined as a success rate >90% (note: no arrow is seen for anastomotic repairs as a success rate was >90% starting with the first cases).

Table 1. Assessment of impact of time from fellowship and case numbers on surgical outcomes and presence of surgical complications by repair type and repair location

			Repair Location				Repair Type			
	Overall		Bulbar Urethroplasty		Penile Urethroplasty		Anastomotic Urethroplasty		Graft or Flap Urethroplasty	
	*Time in months from fellowship**									
	OR	95% CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Secondary procedure	0.99	0.97-1.01	**0.96**	0.93-0.99	1.04	1.00-1.09	0.94	0.89-1.00	0.97	0.94-1.00
Postoperative complications	**0.97**	0.95-0.99	**0.97**	0.94-1.00	0.96	0.92-1.00	0.97	0.93-1.02	0.98	0.94-1.01
EBL >200 cc	1.00	0.98-1.02	1.00	0.98-1.02	0.97	0.93-1.02	1.01	0.99-1.04	0.99	0.96-1.01
	Case volume (by 10 cases)†									
Secondary procedure	0.93	0.85-1.03	**0.82**	0.72-0.95	1.13	0.93-1.38	0.83	0.62-1.12	**0.82**	0.69-0.97
Postoperative complications	0.92	0.82-1.02	0.92	0.80-1.04	0.90	0.73-1.12	0.92	0.74-1.15	0.94	0.79-1.11
EBL >200 cc	1.00	0.93-1.08	1.04	0.95-1.14	1.01	0.82-1.25	1.09	0.96-1.25	0.99	0.87-1.12

EBL, estimated blood loss; OR, odds ratio.
Values in bold indicate statistically significant odds ratios.
* Odds ratios represent the odds of performing a secondary procedure, postoperative complications or EBL >200 for every month out from fellowship.
† Odds ratios represent the odds of performing a secondary procedure, postoperative complications or EBL >200 for every 10 cases performed after completion of fellowship.

noted in a recent study by Birkmeyer et al, good surgical technique (in laparoscopic bariatric surgery) correlates directly with improved surgical outcomes.[20] To continue to improve surgical outcomes in technically demanding operations such as urethral reconstruction, assessment of individual surgical outcomes, rigorous comparison of outcomes with colleagues, and continued surgical education or mentoring will be required.[21]

The relatively few number of surgeons involved and the resulting heterogeneity of surgical outcomes limit this study. A meaningful curve was generated using these data, although more surgeons and more urethroplasties would help to further refine the slope of the curve and the exact average number to reach proficiency. In addition, we could not stratify by urethroplasty complexity as we were able to do with stricture location and type of repair. It is possible that variations in surgical outcomes between surgeons and by years noted in the study could have been influenced by the stricture itself and the type of cases taken on by the surgeon (eg more complex cases might be attempted later in one's career) and thus affected the generated learning curves.

CONCLUSION

This study found that surgical proficiency in urethral reconstruction is reached after a learning curve that spans nearly 100 cases. However, overall success rates varied widely among study surgeons, suggesting the opportunity and the need for continued surgical education for technically demanding surgeries, such as urethral reconstruction, even after fellowship training. The implications of these findings on performance of urethral reconstruction in a nonreferral-based setting where fewer urethroplasties are performed yearly will need to be examined further.

References

1. Mangera A, Patterson JM, Chapple CR. A systematic review of graft augmentation urethroplasty techniques for the treatment of anterior urethral strictures. *Eur Urol*. 2011;59:797-814.
2. Santucci RA, Mario LA, McAninch JW. Anastomotic urethroplasty for bulbar urethral stricture: analysis of 168 patients. *J Urol*. 2002;167:1715-1719.
3. Eltahawy EA, Virasoro R, Schlossberg SM, McCammon KA, Jordan GH. Long-term followup for excision and primary anastomosis for anterior urethral strictures. *J Urol*. 2007;177:1803-1806.
4. Bullock TL, Brandes SB. Adult anterior urethral strictures: a national practice patterns survey of board certified urologists in the United States. *J Urol*. 2007;177:685-690.
5. Anger JT, Buckley JC, Santucci RA, Elliott SP, Saigal CS. Urologic Diseases in America Project. Trends in stricture management among male Medicare beneficiaries: underuse of urethroplasty? *Urology*. 2011;77:481-485.
6. Figler BD, Gore JL, Holt SK, Voelzke BB, Wessells H. High regional variation in urethroplasty in the United States. *J Urol*. 2015;193:179-183.
7. Pansadoro V, Emiliozzi P. Internal urethrotomy in the management of anterior urethral strictures: long-term followup. *J Urol*. 1996;156:73-75.
8. Steenkamp JW, Heyns CF, de Kock ML. Internal urethrotomy versus dilation as treatment for male urethral strictures: a prospective, randomized comparison. *J Urol*. 1997;157:98-101.
9. Greenwell TJ, Castle C, Andrich DE, MacDonald JT, Nicol DL, Mundy AR. Repeat urethrotomy and dilation for the treatment of urethral stricture are neither clinically effective nor cost-effective. *J Urol*. 2004;172:275-277.
10. Erickson BA, Voelzke BB, Myers JB, et al. Practice patterns of recently fellowship-trained reconstructive urologists. *Urology*. 2012;80:934-937.
11. Erickson BA, Elliott SP, Voelzke BB, et al. Multi-institutional 1-year bulbar urethroplasty outcomes using a standardized prospective cystoscopic follow-up protocol. *Urology*. 2014;84:213-216.
12. Herrell SD, Smith JA Jr. Robotic-assisted laparoscopic prostatectomy: what is the learning curve? *Urology*. 2005;66(suppl 5):105-107.
13. Leroy TJ, Thiel DD, Duchene DA, et al. Safety and peri-operative outcomes during learning curve of robot-assisted laparoscopic prostatectomy: a multi-institutional study of fellowship-trained robotic surgeons versus experienced open radical prostatectomy surgeons incorporating robot-assisted laparoscopic prostatectomy. *J Endourol*. 2010;24:1665-1669.
14. Zorn KC, Orvieto MA, Gong EM, et al. Robotic radical prostatectomy learning curve of a fellowship-trained laparoscopic surgeon. *J Endourol*. 2007;21:441-447.
15. Pendlimari R, Holubar SD, Dozois EJ, Larson DW, Pemberton JH, Cima RR. Technical proficiency in hand-assisted laparoscopic colon and rectal surgery: determining how many cases are required to achieve mastery. *Arch Surg*. 2012;147:317-322.
16. Rompre MP, Nadeau G, Moore K, Ajjaouj Y, Braga LH, Bolduc S. Learning curve for TIP urethroplasty: a single-surgeon experience. *Can Urol Assoc J*. 2013;7:E789-E794.
17. Singh P, Dogra PN, Kumar R, Gupta NP, Nayak B, Seth A. Outcomes of robot-assisted laparoscopic pyeloplasty in children: a single center experience. *J Endourol*. 2012;26:249-253.
18. Liu JS, Hofer MD, Oberlin DT, et al. Practice patterns in the treatment of urethral stricture among American urologists: a paradigm change? *Urology*. 2015;86:830-834.
19. Burks FN, Salmon SA, Smith AC, Santucci RA. Urethroplasty: a geographic disparity in care. *J Urol*. 2012;187:2124-2127.
20. Birkmeyer JD, Finks JF, O'Reilly A, et al. Surgical skill and complication rates after bariatric surgery. *N Engl J Med*. 2013;369:1434-1442.
21. Sinclair P, Fitzgerald JE, Hornby ST, Shalhoub J. Mentorship in surgical training: current status and a needs assessment for future mentoring programs in surgery. *World J Surg*. 2015;39:303-313, discussion 314.

EDITORIAL COMMENT

The members of the Trauma and Urologic Reconstruction Network of Surgeons (TURNS) have once again significantly advanced the field of reconstructive urology. This group has consistently combined prospective, multi-institutional data allowing the development of clean and accurate analyses of various surgical procedures for the betterment of reconstructive urology.[1-8]

In this paper, the TURNS group has combined data from 6 different sites in order to objectively evaluate the learning curve for urethroplasty.[9] The purpose was to analyze the early surgical outcomes from a group of young reconstructive surgeons in order to provide an estimate of the number of cases needed to reach surgical proficiency, which is a commonly held standard with a success rate of >90%. Their hypothesis was that urethroplasty outcomes would improve with the number of cases performed over time.

The efforts of this multi-institutional working group to prospectively combine data from multiple facilities allowed for the in depth statistical analysis of a surgical procedure often performed less than once per year by the general urologist. The numbers are excellent with the database including 613 different procedures including not only surgical outcomes but also stringent patient reported outcomes based on validated questionnaires such as the American Urological Association Symptom Score, the International Index of Erectile Function, a Likert scale of overall health, and the Male Sexual Health Questionnaire.

One of the most poignant conclusions of this review is that there still remains no substitution for the repetition of cases in order to improve outcomes and minimize complications. Furthermore, most of this repetition may need to take place after the completion of surgical training—with the newly minted surgeon performing these procedures on their own. This observation is supported in multiple specialties and fields, and commonly referred to as the "10,000-hour rule" which holds true for many specialty skill sets including aviation, computer programing, the performing arts, and sports, and has been written about in books such as *Outliers*.[10] This lends credence to the idea that repetition remains the best training tool that we have in our field.

Also striking is the observation that even in this group of reconstructive surgeons, the average number of urethroplasties was only 21.8 per year. In order to reach the predefined status of excellence, this analysis indicates that these surgeons will need to complete 100 urethroplasties which is striking in that even in this super-specialized group these surgeons will still need to be in practice for more than 5 years in order to reach this status. The authors correctly state that without the current system of subspecially referral, the average urologist (who performs less than 5 urethroplasties per year) will need over 20 years of practice in order to gain the skills to achieve excellence. This observation lends credence to the support of a referral-based system for subspecialty care which has been discussed in other editorials.[11]

The members of the TURNS collaboration should be congratulated on this herculean effort. The work of this group has impacted reconstructive urology in multiple ways and has repeatedly advanced this field so that we now are looking at objective data rather than simple case series and ad hoc experiences reported by single surgeons!

Andrew C. Peterson, M.D., Duke University, Durham, NC

References

1. Breyer BN, McAninch JW, Whitson JM, et al. Effect of obesity on urethroplasty outcome. *Urology*. 2009;73:1352.
2. Erickson BA, Voelzke BB, Myers JB, et al. Practice patterns of recently fellowship-trained reconstructive urologists. *Urology*. 2012;80:934.
3. Brant WO, Erickson BA, Elliott SP, et al. Risk factors for erosion of artificial urinary sphincters: a multicenter prospective study. *Urology*. 2014;84:934.
4. Erickson BA, Elliott SP, Voelzke BB, et al. Multi-institutional 1-year bulbar urethroplasty outcomes using a standardized prospective cystoscopic follow-up protocol. *Urology*. 2014;84:213.
5. Erickson BA, Elliott SP, Myers JB, et al. Understanding the relationship between chronic systemic disease and lichen sclerosus urethral strictures. *J Urol*. 2015;doi:10.1016/j.juro.2015.08.096.
6. Patel DP, Elliott SP, Voelzke BB, et al. Patient-reported sexual function after staged penile urethroplasty. *Urology*. 2015;86:395.
7. Redshaw JD, Broghammer JA, Smith TG III, et al. Intralesional injection of mitomycin C at transurethral incision of bladder neck contracture may offer limited benefit: TURNS Study Group. *J Urol*. 2015;193:587.
8. Bertrand LA, Warren GJ, Voelzke BB, et al. Lower urinary tract pain and anterior urethral stricture disease: prevalence and effects of urethral reconstruction. *J Urol*. 2015;193:184.
9. Faris SF, Myers JB, Voelzke BB, et al. Assessment of the male urethral reconstruction learning curve. *Urology*. 2015. doi: 10.1016/j.urology.2015.11.038.
10. Gladwell M. *Outliers the Story of Success*. New York: Little, Brown and Co; 2008.
11. Santucci RA. Should we centralize referrals for repair of urethral stricture? *J Urol*. 2009;182:1259.

http://dx.doi.org/10.1016/j.urology.2015.11.039
UROLOGY 89: 142–143, 2016.