Original Article

The impact of a continuing international partnership and multiple intensive hands-on workshops on the success rate of bulbar EPA urethroplasty in a low-middle income country: an early experience

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Background: Thailand has one of the 10 highest national rates of traffic accidents, leading to a high incidence of urethral stricture from bulbar straddle and pelvic fracture urethral injuries. Various treatment options are offered including urethroplasty; however, failure rates are high leading to a significant societal burden. Outreach relationships were established between the United States of America (USA), Vietnam, and Thailand by creating an intensive hands-on workshop and mentorship model to improve urethroplasty success. We aim to report the impact of this partnership and hands-on training on bulbar excision and primary anastomosis (EPA) success rates.

Methods: The University of California, Irvine Medical Center (UC Irvine), USA, Binh Dan Hospital, Vietnam, and Thammasat University Hospital (TUH), Thailand developed partnerships in urethroplasty training since 2020. Urologists from Thailand seeking expertise in urethroplasty joined intensive hands-on workshops for two 2-week periods. An ongoing mentorship relationship subsequently developed. Important infrastructure similar to that at UC Irvine, a urethroplasty Center of Excellence, was established at TUH to include the purchase of identical urethroplasty and urethral imaging-specific equipment and supplies. Subsequent workshops were attended and hosted at TUH. A database was created to compare success rates before and 12 months after completing the workshops and establishing infrastructure. Cystoscopy 4 months after surgery was performed to assess anatomical success.

Results: The study included 29 patients with bulbar urethral stricture who underwent bulbar EPA. There were 19 patients from before the establishment of the partnership that included workshops and infrastructure development. The overall success rate was 57.14%, whereas in comparison, success rates of over 98% were published at Centers of Excellence. After establishing the partnership, bulbar EPA was performed in 10 cases. The success rate increased to 90% (P=0.001) which included anatomical success defined as wide patency on cystoscopy 4 months after surgery and a subsequent absence of recurrent voiding symptoms. The patients who underwent urethroplasty during the workshop and learning period were excluded from this study.

Conclusions: Developing and continuing international partnerships with a mentorship model and multiple intensive hands-on workshops, including established appropriate hospital infrastructure could improve the success rate of bulbar urethroplasty in countries seeking to develop a urethroplasty Center of Excellence.

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Introduction

Male urethral stricture disease causes include trauma, iatrogenesis, lichen sclerosus, infection, and idiopathic conditions (1). The incidence of urethral stricture in Thailand is unknown, but the World Health Organization (WHO) ranks Thailand as the country with the 9th highest rate of traffic accidents (2), which often cause bulbar urethral straddle and pelvic fracture urethral injuries (PFUI) (3,4), leading to bulbar and posterior urethral stricture. Furthermore, Thailand has a high incidence of sexually transmitted diseases (41.97% in 100,000 population) which can cause anterior urethral stricture (5).

Highlight box

Key findings

- The sustainable international partnerships, which included multiple intensive hands-on workshops with the mentorship model, and the establishment of appropriate hospital infrastructure could improve the success rate of bulbar excision and primary anastomosis (EPA) in a low-middle-income country.

What is known and what is new?

- Urethral stricture is a challenging problem in low- to middle-income countries where there is a high incidence of urethral injuries from traffic accidents and sexually transmitted diseases. Endoscopic procedures are often used repeatedly, even for long or non-bulbar strictures. Urethroplasty, when performed, is often associated with poor outcomes as these surgeries are generally performed by urologists without sub-specialty training in reconstructive urology.
- A sustainable United States-Vietnam-Thailand international mentor-mentee partnership was developed that provided multiple intensive hands-on workshops. The focus was urethral evaluations and imaging, decision-making, proper patient positioning, urethral exposure and mobilization, and bulbar EPA surgeries. This was associated with a significant improvement in success rate.

What is the implication, and what should change now?

- The establishment of these partnerships, which includes all aspects of urethroplasty training could improve the success rate of bulbar EPA in countries without fellowship-trained sub-specialists seeking expertise in this field. Furthermore, this teaching model could be adapted to other reconstructive procedures.

Urethral stricture treatment options range from endoscopic procedures like dilatation or direct vision internal urethrotomy (DVIU), to open reconstruction (6,7). Urologists who lack sufficient experience to perform urethroplasty often prefer dilatation or DVIU, which are technically simple, less expensive, and are associated with less indwelling urethral catheter time after the procedure. The recovery after endoscopic treatment is much shorter than after urethroplasty. However, these methods are associated with a high recurrence rate (50–92%) (8,9) and are less effective than urethroplasty (10). Dilation and DVIU are considered to be appropriate initial treatment options for short bulbar strictures (6,7), but are often inappropriately used for longer and recurrent strictures (11). This is especially true in Thailand, a country that lacks urologists with urethroplasty expertise. Endoscopic treatment is often the only option offered to patients with urethral stricture disease. However, repeated procedures lead to near-zero cure rates (12). Non-expert urethroplasty or repeated endoscopic treatments can cause further damage to the urethra, causing morbidity and the need for a more difficult re-do reconstruction (1,13,14).

Thammasat University Hospital (TUH) in the northern part of Bangkok, Thailand, is a referral and trauma center which handles challenging cases of urethral stricture. We, the authors, initially developed our urethroplasty skills at TUH by watching demonstration videos, reading articles and the Atlas textbook, and attending live and semi-live demonstrations and conferences. However, although bulbar excision and primary anastomosis (EPA) repair may be the simplest urethroplasty, where the highest published success rates are 98%+, our success rate was low (15,16). It is reported that it may take as many as 70–90 cases to become proficient (17,18). However, this is generally associated with surgery performed in association with formal Fellowship training. In Thailand, Fellowship training is not available. Most programs that offer training are in the United States, often at Universities that require United States Citizenship.

In an effort to help bridge that gap, a mentor-mentee outreach relationship was established in 2020 between Universities in the United States of America (USA),

Vietnam, and our hospital in Thailand to improve knowledge of urethral stricture disease, patient evaluation, and preparation for surgery along with critical decision-making, and the steps and details of urethroplasty surgeries through multiple intensive 1–2 weeks hands-on workshops. It was our hypothesis that the establishment of this partnership would lead to improved outcomes. We report the impact of the success in an early period of this ongoing partnership. The focus was bulbar EPA because it is the most commonly performed urethroplasty with a potential for a high success rate.

Methods

The University of California, Irvine Medical Center (UC Irvine), USA, which has a reconstructive urology Fellowship program approved by the Society of Genitourinary Reconstructive Surgeons (GURS), Binh Dan Hospital, a high-volume urethroplasty Center of Excellence in Ho Chi Minh City, Vietnam, and TUH, Thailand, have developed partnerships in urethroplasty training since 2020. Furthermore, Binh Dan Hospital and UC Irvine have had a partnership in urethroplasty training since 2015 and have infrastructure similar to UC Irvine. Two urologists from TUH, who were interested in being experts in urethroplasty attended the intensive hands-on workshop for two 2-week periods in August 2022 and April 2023 at Binh Dan Hospital. An ongoing mentorship relationship subsequently developed since the first workshop. Important infrastructure similar to that at UC Irvine was established at TUH to include the purchase of identical urethroplasty and urethral imaging-specific equipment and supplies including the Jordan-Simpson perineal retractor. Subsequent workshops were attended and hosted at our University. Moreover, the faculty of Binh Dan Hospital provided a 2-day hands-on workshop at TUH in November 2022.

The workshops and review of cases prior to the workshops initially focused on evaluation and decision-making. This included a review of all patient histories in advance so that there would be a period of urethral rest before surgery, which could include advance placement of a suprapubic tube, and a review of the assessment of the stricture site and length by the precise technique of high-quality urethral imaging [retrograde urethrogram (RUG), and voiding cystourethrogram (VCUG)], including flexible cystoscopy. The subsequent mentor-mentee focus was on operative techniques. Most surgeries were EPA, and occasionally, substitution urethroplasty was performed during the workshops.

All patients who underwent bulbar EPA at Thammasat University Hospital in Pathumthani, Thailand, between 2018–2023 were recruited in this study. This study was performed in line with the principles of the Declaration of Helsinki (as revised in 2013). The study protocol was approved by the Ethics Committee of Thammasat University (Date June 25, 2024/No. MTU-EC-SU-0-013/67). All participants provided written informed consent before participation in the research. The patients' information was retrospectively collected, including age, body mass index (BMI), underlying disease, cause of stricture, stricture length, previous treatment, the urethroplasty technique, evaluation of success, and follow-up interval. The 30 patients who underwent urethroplasty during the workshop and learning period between August 2022–April 2023 were excluded from this study. The outcomes of urethroplasty between 2018–2022, prior to the establishment of the partnership that included an intensive workshop and infrastructure, defined the success rate before establishing partnership. The outcomes of urethroplasty after finishing the last workshop and completing the necessary infrastructure at 12 months defined the success rate after partnership was established. The necessary infrastructure consisted of equipment for precise urethral imaging, for example, Gelman adapter, portable X-ray, etc., and the necessary surgical instruments such as Jordan-Simpson urethroplasty retractor, dissecting instruments, etc., identical to the equipment and supplies at Binh Dan Hospital and UC Irvine.

All urethroplasties were performed by the 2 surgeons who attended the workshop with a mentorship model. All cases were performed in high lithotomy position. A one-layer EPA was used for proximal bulbar strictures near the membranous urethra, where there is insufficient ventral corpus spongiosum for a 2-layer repair. For mid to distal bulbous strictures, a 2-layer repair was used. A 14 French (Fr) urethral catheter, used as a urethral stent, and a suprapubic tube to drain urine were left in place for 3 weeks. Patients were discharged home on the 4th day after removing the Radivac drains. At 3 weeks post-surgery, all patients underwent VCUG in the Urology clinic. If the repair site had healed, the urethral catheter and suprapubic tube were removed. If leakage was revealed, weekly urethrograms were performed until the site healed.

All patients underwent cystoscopy to check the urethroplasty site at 4 months after surgery.

The definition of early anastomotic success in this

study was that a 17-Fr flexible cystoscope could easily pass the anastomosis site at 4 months, where we observed a wide, patent urethra with easy passage of the cystoscope (6,16,19-21). Only patients who returned for cystoscopy were included in our assessment of success rate. Long-term follow-up included annual symptom assessment (focus on obstructive voiding symptoms) and uroflowmetry (maximum flow rate, Qmax). Long-term success was defined as no obstructive voiding symptoms attributed to stricture recurrence or need for intervention. A database was created to retrospectively evaluate the success rate at 12 months after completing the last workshop. The follow-up protocol included a 4-month cystoscopy for patients who underwent urethroplasty both before and after the workshop learning period.

Statistical analysis

Statistical analysis was conducted by using T-test and Fisher's exact test to compare the two groups. STATA statistical Software Version 15 (StataCorp, College Station, Texas) was used for data analysis, with P value of <0.05 considered statistically significant.

Results

Demographic data

After reviewing all bulbar EPA cases performed during the specified period, a total of 19 patients were identified in the before-partnership group, while 10 patients were included in the after-partnership group. Age was not different between before- and after-partnership groups (*Table 1*). The most common cause of stricture was trauma in the before-partnership group and iatrogenic in the after-partnership group, which was not a statistically significant difference. All traffic accidents were caused by motorcycle accidents, resulting in straddle injuries that led to isolated bulbar urethral injuries. None of the patients had PFUI. The average stricture length in both groups was 1.2 and 1.1 cm (P=0.55). More than 50% of patients underwent endoscopic procedures, especially urethral dilatation, before treatment with urethroplasty in both groups. Additionally, the proportion of patients who underwent endoscopic procedures was higher in the referral cases compared to those treated primarily at our clinic (urology clinic, TUH). There was an average of 3 dilatations before surgery in the before-workshop group and 1.2 in the after-partnership group. Even though the difference was not statistically significant, the decrease in repeated dilatation may be because after improving knowledge from the workshop, the authors revised their practice to perform early urethroplasty instead of repeated endoscopic management. Moreover, the authors instructed other urologists about proper management, including early urethroplasty.

The outcome of urethroplasty before and after establishing a partnership

The before-partnership group included 19 bulbar urethral stricture patients who underwent EPA (*Table 2*). There was success in 8 cases, recurrent stricture in 6 cases, and 5 cases did not come for follow-up. EPA with one-layer repair were performed in 13 cases (success rate of 60%), and EPA with two-layer repair was performed in 6 cases (success rate of 50%). The overall success rate of bulbar EPA was 57.14%. A mean follow-up interval (defined as the time interval between surgery and the most recent visit) was 11.2 months.

After finishing the last workshop and completing the necessary infrastructure, bulbar EPA was performed in 10 cases. All of these cases returned for a 4-month cystoscopy. Only one patient had a recurrent stricture (90% success rate). The median follow-up interval was 12.9 months. No additional recurrences (defined as obstructive symptoms or need for intervention) were identified. The success rate for bulbar EPA increased significantly after the workshop (P=0.001) (*Table 2*).

Actually, during the learning period between August 2022–April 2023, after excluding cases during the workshops period there were 2 patients with bulbar stricture that underwent EPA, which was which was success confirmed by cystoscopy at 4 months. However, this data was in between the learning period by the definition of this study, therefore, it was not included in the analysis.

Discussion

Although endoscopic urethral stricture surgery is technically simple and with a lower procedure treatment cost and shorter recovery period compared to urethroplasty, dilations and urethrotomies, especially when repeated, are not considered a cost-effective approach to treatment (22). In contrast, a properly performed urethroplasty offers higher success rates and lower overall treatment costs, especially for recurrent strictures. Published guidelines recommend urethroplasty as an option for the initial treatment of bulbar strictures

Table 1 Demographic data of the before-partnership group and after-partnership group

Variables	Before partnership (N=19)	After partnership (N=10)	P value
Age (years), mean (SD)	57.7 (16.3)	58.2 (22.3)	0.95
BMI (kg/m^2), mean (SD)	25.4 (4.8)	23.1 (3.7)	0.23
Cause of stricture, n (%)			0.07
Unknown	5 (26.32)	3 (30.00)	
Infection	3 (15.79)	1 (10.00)	
Trauma	9 (47.37)	1 (10.00)	
Iatrogenic	2 (10.53)	5 (50.00)	
Cause of trauma, n (%)			0.63
Traffic accident	5 (50.00)	1 (100.00)	
Fall from high	4 (40.00)	0	
Body assault	1 (10.00)	0	
Stricture length (cm), mean (SD)	1.2 (0.5)	1.1 (0.3)	0.55
Previously managed with endoscopic procedure[a,b], n (%)	14 (73.68)	6 (60.00)	>0.99
Primarily at clinic	6 (42.86)	2 (33.33)	
Referral cases	8 (57.14)	4 (66.67)	
Urethral dilatation before surgery, n (%)	13 (68.42)	6 (60.00)	>0.99
Primarily at clinic[c]	5 (38.46)	2 (33.33)	
Referral cases	8 (61.54)	4 (66.67)	
Number of urethral dilatations before surgery, mean (SD)	3 (2.7)	1.2 (0.4)	0.22
DVIU before surgery[d], n (%)	2 (10.53)	1 (10.00)	>0.99
Bulbar excision and primary anastomosis, n (%)			0.68
EPA 1 layer	13 (68.42)	8 (80.00)	
EPA 2 layers	6 (31.58)	2 (20.00)	

[a], two patients had no information available regarding previous endoscopic treatment. [b], endoscopic procedure include both dilatation and DVIU. [c], Urology Clinic, Thammasat University Hospital. [d], all cases underwent DVIU at our clinic. BMI, body mass index; DVIU, direct vision internal urethrotomy; EPA, excision and primary anastomosis; SD, standard deviation.

and the preferred treatment for longer and recurrent strictures (6,7,23). There is a growing trend toward earlier use of urethroplasty for the treatment of bulbar and other strictures (9). However, this trend has been more prominent in the United States, where many urologists are Fellowship-trained sub-specialists, and have access to specialized equipment. It should be emphasized that guidelines statements that recommend urethroplasty assume the urethroplasty is being performed with a high success rate. Highlighting this important point is a guidelines statement that urologists who do not perform urethroplasty should refer to surgeons with expertise. That is not possible when there is no option for referral to an expert. In Thailand, there are no Fellowship training programs, and there is a lack of fellowship-trained experts in urethral stricture surgery. Most urologists do not perform urethroplasty.

When there is no option for a referral to an expert unless the patient is willing and able to travel to different country for care, the only option for urethroplasty is for the surgery to be performed with a doctor who does not have specialized training in urethral reconstructive surgery. There is little data from Thailand indicating the success rates when urethroplasty is performed by General urologists. Urologists from Universities who perform urethroplasty

Table 2 The outcomes of urethroplasty before and after partnership

Outcomes	Before workshop (N=19)	After workshop (N=10)	P value
VCUG at 3 weeks follow-up, n (%)			>0.99
Stricture	0 (0)	0 (0)	
Contrast extravasation	1 (5.26)	0 (0)	
Patent	18 (94.74)	10 (100.00)	
Bulbar excision and primary anastomosis results[a]	19	10	
EPA 1 layer, n (%)	13 (100.0)	8 (100.0)	0.049*
No stricture	6 (46.15)	8 (100.0)	
Re-stricture	4 (30.77)	0 (0)	
Lost to follow-up	3 (23.08)	0 (0)	
EPA 2 layers, n (%)	6 (100.0)	2 (100.0)	0.64
No stricture	2 (33.33)	1 (50.00)	
Re-stricture	2 (33.33)	1 (50.00)	
Lost to follow-up	2 (33.33)	0	
Overall success rate	57.14%	90%	0.001*
Follow-up length (months), median (IQR)	11.2 (2.0–41.4)	12.9 (8.7–18.5)	0.73
Qmax at 1-year follow-up (mL/sec), mean (SD)	25.1 (2.6)	25.5 (4.9)	0.92

[a], the definition of success (no stricture) was the 17-Fr flexible cystoscope could easily pass the anastomotic site at 4 months without additional recurrences. *, statistically significant. EPA, excision and primary anastomosis; IQR, interquartile range; SD, standard deviation; VCUG, voiding cystourethrography.

have recently presented data at national meetings indicating success rates of approximately 25%, but that data has not been published. A review of the literature from Thailand includes reports of success rates higher than 25%, but these retrospective reviews do not include a follow-up protocol that indicates rate of compliance with follow-up, and a success may represent patients that did not return to the hospital where the surgery was performed where they then required treatment for a stricture recurrence (13,24,25).

One way to help bridge the gap between the standard of care in high-income and low-middle-income countries is attendance at conferences that include semi-live or broadcast surgeries. These are generally several-day events and do not include actual mentorship. Actual hands-on 1–2 weeks workshops exist, including those sponsored by International Volunteers in Urology (IVUmed). Those workshops are in only a few countries selected by the organization with a focus in Africa. A study from Senegal demonstrated that a hands-on workshop was associated with subsequent improved urethroplasty success rates by the local doctors from 16.7% to 35.1% (26). Success was defined as no need for intervention for a minimum of 6 months and patient satisfaction, where the definition of satisfaction was not specified (27). It is quite possible that 35.1% represents an overestimation of anatomic wide patency as cystoscopy was not part of the follow-up protocol. Although this represents an improvement in outcomes, this represents a very low success rate compared to the 95–99%+ success rate that can be achieved for EPA at a Center of Excellence where the surgery is performed by Fellowship-trained experts. It was suggested that the low success rate was attributed to a lack of sufficient expertise of the local doctors, inadequate equipment, and inability to evaluate patients properly before surgery.

A presented abstract from Vietnam, a low-middle-income country, found that annual hands-on training in urethral evaluations and urethroplasty with a mentor-mentee model over nine years significantly enhanced surgical skills. With ongoing mentorship and infrastructure that included the acquisition of urethroplasty-specific equipment including the first flexible cystoscopes in the country, these surgeons achieved an 88% success rate for bulbar stricture and 98%

for PFUI repairs (28).

The Vietnam partnership experience has not been published as of the time of this manuscript submission. However, the presented data indicates that with a hands-on training experience with a focus on training one Urologist over multiple workshops, this provided the trainee a urethroplasty case volume that exceeds the 60 cases minimum provided by GURS Fellowship programs. A previous study determined that even for bulbar urethroplasty, an experience of 70–90 cases is needed to achieve proficiency (defined as success >90%) (17). In that study, the success rate for bulbar EPA reached 95% after fellowship training. In contrast to the urologists in Senegal, the Vietnamese Urologist was provided with mentorship over a prolonged period where the focus was the intensive training of an individual Urologist who was then provided urethroplasty specific equipment, and the hospital in Vietnam had the infrastructure to support the development of a urethroplasty Center of Excellence in Vietnam. Our objective was to develop a similar partnership.

The focus was EPA for bulbar strictures. Although patients with more complex, longer, and recurrent strictures present to our hospital, and we also perform substitution urethroplasty, these surgeries are not currently performed at a sufficient volume to allow meaningful outcome comparisons. Furthermore, our objective was to first obtain expertise with urethral imaging, positioning, obtaining urethral exposure and mobilization, and excision and primary anastomotic techniques before focusing on the more difficult and revision cases. Moreover, EPA is a surgery that when properly performed can benefit a high percentage of our patient population where straddle injury is a common stricture cause. Anatomic success, a reflection of technical ability, can be assessed with cystoscopy 4–6 months after surgery. This was included as part of our follow-up protocol. Early anatomic success is not a guarantee of life-long cure. However, studies with long-term follow-up have demonstrated that when there is wide patency 4–6 months after surgery where cystoscopy was performed, the long-term success was high. This was especially the case for EPA in particular where less than 1% of patients who were found to have wide patency on cystoscopy 4 months after surgery developed a late stricture recurrence (6,16,19).

The most significant improvements in our practice after the workshops included online communication for preparation before the workshops and the acquisition of specialized equipment have been higher quality pre-operative imaging, better decision-making, and markedly improved surgical technique to include positioning, urethral exposure and mobilization, and excision with a precise anastomosis. This is reflected in our much higher EPA success rate after the learning period, increasing from 57% to 90%, confirmed with flexible cystoscopy.

This study has several limitations, including a small sample size with a short follow-up. Although we also perform substitution and PFUI urethroplasty, and these were occasionally performed during our workshops, this study did not assess the impact of our mentor-mentee partnership on the outcomes of these other surgeries.

Our improved success rates and patient satisfaction have been recognized by referring urologists. As a result, urologists nationwide have invited us to share our expertise at national conferences and in lectures for both urologists and Residents. Through these efforts, we have emphasized the importance of appropriate primary management for urethral stricture disease and encouraged earlier referrals to our clinic, helping to avoid inappropriate repeated endoscopic procedures.

Our future goal with a continued partnership is to build on the basic skills learned and apply those skills to more complex procedures. The ultimate goal is to develop the first urethroplasty Center of Excellence in Thailand, providing urologists with a referral source for patients who would benefit from urethroplasty performed with expertise leading to a high probability of cure.

Conclusions

The development of a sustainable international partnerships that include multiple intensive hands-on workshops, and the establishment of appropriate hospital infrastructure can markedly improve the success rate of bulbar EPA. The findings of this study could serve as a model for other countries, low-middle income countries in particular that do not provide Fellowship training in reconstructive urology that are seeking expertise in this field. Furthermore, this teaching model could be adapted to other reconstructive procedures where sub-specialty expertise is highly related to outcomes.

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Footnote

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. This study was performed in line with the principles of the Declaration of Helsinki (as revised in 2013). Approval was granted by the Ethics Committee of Thammasat University (Date June 25, 2024/No. MTU-EC-SU-0-013/67). All study participants provided written informed consent before participation in the research.

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