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Journal
World Journal of Urology, 40(8)

ISSN
0724-4983

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Publication Date
2022-08-01

DOI
10.1007/s00345-022-03988-3

Peer reviewed

World Journal of Urology (2022) 40:1971–1980
https://doi.org/10.1007/s00345-022-03988-3

INVITED REVIEW

Comparative review of the guidelines for anterior urethral stricture

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Received: 4 January 2022 / Accepted: 7 March 2022 / Published online: 22 March 2022

Abstract

Purpose We aimed to provide a detailed comparison between the American Urologic Association (AUA), Société Internationale d'Urologie (SIU), and the European Association of Urology (EAU) guidelines on the evaluation, management, and follow-up of the patients with anterior urethral stricture disease (USD).

Methods The urethral stricture guidelines from SUI, AUA, and EAU were collected and evaluated regarding the recommendations on diagnosis, evaluation, and treatment of anterior USD. The strength of evidence for each statement was included and discussed when guidelines differed.

Results While the guidelines remarkably align in terms of the diagnostic workup and follow-up, there is discordance in the management of anterior urethral strictures, specifically for the use of endoscopic treatment and stenting. Further, the EAU offers more comprehensive recommendations regarding urethroplasty techniques and patient follow-up. The EAU guidelines are the most recent and first to offer guidance for USD in transgender people and women.

Conclusion Reconstructive urology is a rapidly adapting field, and best practices change accordingly. Guideline statements have become more inclusive and expansive but will require further research to improve the level of evidence and continue to provide patients and providers with the best treatment plans.

Keywords Urethral Stricture · Guidelines · Urethroplasty · Anterior · Reconstructive Surgery

Introduction

Urethral stricture refers to abnormal narrowing of the urethra due to fibrosis in the mucosa [1]. While most strictures are idiopathic, many can be linked back to infective urethritis and urethral instrumentation, namely catheterization, transurethral procedures, and treatments for prostate cancer [1, 2]. In the United States, a diagnosis of urethral stricture disease (USD) -regardless of comorbidities- is associated with a trifold rise in annual health expenditures in insured men [3].

Société Internationale d'Urologie (SIU) and American Urologic Association (AUA) had previously published guidelines on the evaluation, management, and follow-up for urethral strictures in 2010 and 2016, respectively [4, 5]. The European Urologic Association (EAU) published guidelines for evaluation and management in 2021 [6, 7]. We sought to provide a comprehensive review comparing the AUA, SIU, and EAU guidelines for assessment, management, and follow-up of patients with urethral stricture. We will focus in particular on scenarios where guidelines differ. This review aims to assist practicing urologists, residents, and fellows with their daily practice when encountering urethral stricture cases, and facilitate more confident decision-making.

Methods

The SUI, AUA, and EAU guidelines were evaluated for recommendations for diagnosis, evaluation, and treatment of anterior USD. The strength of evidence for each statement was included and discussed when guidelines differed. The EAU and SIU guidelines have adopted the Oxford classification system, while AUA has developed a distinct

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evidence-grading system [8]. SIU stratified their strength from A to D solely based on the level of evidence [4]. The EAU guideline's recommendations are based on a modified GRADE methodology taking into consideration the level of evidence, the magnitude of effect, certainty of the results, the balance between desirable and undesirable outcomes, as well as the impact and certainty of patient values and preferences for the intervention [6, 9]. AUA approaches the recommendations strength on the basis of evidence strength, certainty level, the magnitude of benefit or risk/burdens, as well as the Panel's judgment regarding the benefits and risks/burdens [5] (see appendix).

Stricture prevention

Despite the availability of antibiotic therapy, infective urethritis still plays a major role in the developing world [2, 10]. The EAU suggests providers offer safe sex practices, recognize the symptoms of sexually transmitted infections, and promptly investigate/treat men with urethritis [EAU: Strong] [11, 12].

A plurality of USD cases is iatrogenic due to traumatic catheterization, transurethral interventions, or prostatectomy [13]. Accordingly, EAU discourages unnecessary catheter placement and training programs for providers to prevent traumatic catheterization [EAU: Strong]. Catheter characteristics could also play a role in stricture disease. EAU recommends avoiding non-coated latex catheterization due to the risk of urethritis/stricture [EAU: Strong] and the use of large catheters (> 18 Fr) for drainage-only purposes [EAU: Weak] [14–17].

Urethral stricture is among the significant complications of transurethral resection of the prostate (TURP) procedures [18]. However, preventive interventions (e.g., concomitant urethrotomy) have not been shown to benefit patients undergoing TURP [6]. EAU strongly recommends avoiding routine urethrotomy for preventive purposes [EAU: Strong]. AUA and SIU offer no recommendations regarding stricture prevention [4, 5].

Evaluation

Initial/pre-operative

The clinical manifestations of USD are diverse, with lower urinary tract symptoms (LUTS) being the most prevalent (54.3%), followed by urinary retention (22.3%), urinary tract infection (UTI) (6.1%), and difficult catheter placement (4.8%) [19]. Studies also note more subtle primary complaints (e.g., incomplete emptying and post-micturition dribbling) [20, 21]. All guidelines agree that the assessment of voiding symptoms/LUTS include validated patient-reported measures (PROMs) (e.g., AUA Symptoms Index [22] and International Prostate Symptom Score [23]), as well as uroflowmetry and post-void residual (PVR) measurement. When planning intervention, providers should assess pre-operative base-line voiding symptoms and uroflowmetry [SIU: B], including use of validated PROMs to assess symptom severity and patient's quality of life [AUA: Clinical principle; EAU: Strong]. These can additionally serve as objective assessments of the procedure outcomes (Table 1).

Sexual dysfunction is common in patients with USD and can change with the intervention [21, 24]. Accordingly, SIU and EAU recommend peri-operative evaluation of erectile and ejaculatory function in patients undergoing stricture surgery through validated tools (e.g., IIEF and MSHQ surveys) [SIU: C; EAU: Strong] [25, 26].

Imaging

Standard diagnostic modalities for USD consist of imaging including retrograde urethrography (RUG), voiding cystourethrography (VCUG), computed tomography (CT), and magnetic resonance imaging (MRI), ultrasound urethrography, and cystourethroscopy. RUG, VCUG, and cystourethroscopy are recommended to diagnose urethral stricture in children [SIU: A]. When suspecting urethral stricture in female patients with LUTS, recruiting a combination of uroflowmetry, PVR determination, VCUG, and/or video-urodynamics could be helpful [EAU: Strong]. In adult men, AUA recommends using either or a combination of cystourethroscopy, RUG, VCUG, and sonourethrography [AUA: Moderate], whereas SIU and EAU guidelines provide more detailed recommendations.

RUG is a reliable means for diagnosing and staging urethral stricture—locating and measuring the length of the stricture—preoperatively [EAU: Strong; SIU: A]. AUA guidelines agree but confine the determination of location and length of the stricture to non-urgent settings only [AUA: Expert opinion]. Moreover, the combination of RUG and VCUG facilitates the evaluation of the entire urethra, including obliterative strictures and pelvic fracture urethral injuries (PFUI), providing optimal pre-operative staging [EAU: Strong; SIU: B]. EAU suggests preference of clamp devices to Foley catheter for RUG as an effort for pain reduction [EAU: Weak]; other guidelines offer no specific recommendations on how the RUG is performed.

The guidelines diverge on their emphasis on cystourethroscopy. The SIU considers cystourethroscopy the most specific tool for diagnosing urethral strictures [SIU: A]. The EAU and AUA consider cystourethroscopy an adjunctive test that may provide further details of the stricture – particularly in anterior stricture where imaging is ambiguous [SIU: B; EAU: Weak].

Table 1 Summary of recommendations for the evaluation of urethral strictures

	Shared	AUA	SIU	EAU
Clinical				
	Uroflow, PVR[V,B,S] PROM (e.g., AUA-SI)[V,S] Sexual function assessment via validated tools (e.g., IIEF or MSHQ)[I,C]	Consider stricture for patients with LUTS, UTI symptoms, increased PVR[II]	Assess voiding symptoms initially[C] and preoperatively[B]	–
Imaging/endoscopy				
Urethrography/VCUG	RUG for diagnosis/evaluation [II,A,S] VCUG to evaluate posterior urethra, particularly obliterative/near obliterative[II,B,S]	–	RUG for staging[A] RUG + VCUG to evaluate the entire urethra & optimal for pre-operative staging[B] VCUG to visualize proximal segment of anterior strictures[B]	Prefer clamp devices to Foley catheter to reduce pain for RUG[W]
Ultrasound urethrography	–	Use sonourethrography for evaluation[II]	Sonourethrography adjunct to RUG for anterior staging[C]	Recognize use of sonourethrography and make no recommendation
Cystoscopy/urethroscopy	Cystourethroscopy as adjunct[II,A,W]	–	Cystourethroscopy is the most specific for diagnosis[C]	-
CT & MRI	–	–	MRI & CT as adjunct for luminal obliteration/ suspecting of associated injuries[C]	Ancillary use of MRI for posterior stenosis[S]

AUA American Urologic Association; *EAU* European Association of Urology; SIU Société Internationale d'Urologie; *PVR* post-void residual; *PROM* patient-reported outcome measures; *AUA-SI* American Urologic Association Symptom Index; *LUTS* lower urinary tract symptoms; *UTI* urinary tract infection; *MSHQ* Male Sexual Health Questionnaire; *IIEF* International Index of Erectile Function; *RUG* retrograde urethrography; *VCUG* voiding cystourethrography; *CT* computed tomography; *MRI* magnetic resonance imaging. – no specific recommendation

[W]Weak recommendation (EAU)

[S]Strong recommendation (EAU)

[A]Recommendation strength A (SIU)

[B]Recommendation strength B (SIU)

[C]Recommendation strength C (SIU)

[I]Strong recommendation (AUA)

[II]Moderate recommendation (AUA)

[V]Clinical principle (AUA)

The guidelines also differ on the recommended use of urethral sonography. The AUA and SIU recommend the pre-operative performance of sonourethrography for staging USD as it may be more sensitive to the length and extent of spongiofibrosis than RUG [AUA: Moderate; SIU: C] [27, 28]. However, the EAU guideline stops short of a recommendation while acknowledging sonourethrography as an easily accessible and relatively low-cost diagnostic modality [6].

MRI has been primarily implemented in evaluating posterior stricture/stenoses such as PFUI. Even though MRI provides the urethral anatomy in greater detail and visualizes the associated injuries, its widespread use has not been recommended, particularly in anterior stricture, where it plays a very limited role.

Management

Initial/urgent management

If a patient is in urinary retention due to stricture, the guidelines agree on prompt urinary drainage. Surgeons can perform blind dilation, DVIU, or suprapubic catheterization (SPC). Temporary SPC can also be offered in patients dependent on urethral catheters or clean intermittent

catheterization for "urethral rest" [AUA: Expert opinion]. The EAU formally recommends against intervention on asymptomatic large-caliber (> 16 Fr) urethral stricture [EAU: Weak]. Long-term SPC could be considered in patients with radiation-induced bulbomembranous strictures, as well as the ones with poor performance scores [EAU: Weak] (Table 2).

Guidelines agree that DVIU and dilation have equal clinical efficacies and could be applied interchangeably [6]. However, the EAU does encourage visually controlled dilation (i.e., dilation following endoscopic/fluoroscopic guidewire placement) over blind dilation due to lower complications [EAU: Weak].

Management of short bulbar strictures differs between the guidelines. The older SIU guidelines suggest a role for dilation/DVIU in long (> 2 cm), multifocal, and obliterative strictures. The AUA and EAU limit dilation/DVIU for short (< 2 cm), single bulbar strictures without prior intervention. Technically, the surgeon may use either hot- or cold-knife urethrotomy based on experience and resources as none is superior to the other [SIU: A; EAU: Strong]. Finally, after uncomplicated dilation/DVIU, guidelines agree on catheter removal within 72 h.

Repeated endoscopic treatment and adjunctive therapies

AUA suggests offering urethroplasty after the failure of the first attempt for endoscopic intervention [AUA: Moderate], whereas SIU recommends repeated dilation/DVIU in short (< 1–2 cm), single, bulbar strictures recurring three months following the initial procedure [SIU: B]. However, according to SIU and EAU, the third endoluminal treatment should be avoided if open reconstruction is a viable option [SIU: A; EAU: Strong] or the stricture recurs within six months of the second procedure [SIU: A]. If urethroplasty is indicated, the patient should be referred to experienced surgeons [AUA: Expert opinion].

Guidelines agree that intermittent self-dilation (ISD) could be considered following dilation/DVIU for non-urethroplasty candidates. As per EAU, patients may also benefit from the application of intra-urethral corticosteroids in addition to ISD [EAU: Weak]. Moreover, in patients requiring long-term ISD (e.g., neurogenic bladder) who encounter urethral stricture, urethroplasty could be offered to ease the catheter placement [AUA: Clinical practice].

To reduce fibroblast proliferation and urethral scarring, intra-lesional corticosteroid or Mitomycin C injections as an adjunct to DVIU have been introduced. Recent evidence has challenged the safety of intralesional Mitomycin C as it has been associated with severe complications, namely osteitis pubis, rectourethral fistula, and necrosis of the bladder floor [29, 30]. Accordingly, EAU discourages the use of post-dilation/DVIU intra-lesional injections outside the frameworks of clinical trials [EAU: Weak].

Urethroplasty

The guidelines agree that the first surgical intervention tends to be the most successful. Accordingly, SIU encourages excision and primary anastomosis (EPA) over augmentation surgeries in the first place [SIU: A]. Urethroplasty should not be performed within three months of urethral manipulation in any form [EAU: Weak], and an antibiotic regimen should be administered during the urethral surgery [EAU: Strong].

Site-specific management

Bulbar strictures

The guidelines largely agree on the management of short bulbar strictures (Table 3). Initial management can be endoscopic treatment. In young, healthy men, particularly with trauma-related stricture, the short stricture can be managed initially with EPA. Conversely, in patients without a history of perineal trauma, non-transecting EPA (ntEPA) or graft urethroplasty (e.g., dorsal onlay urethroplasty) could be considered for short bulbar strictures [EAU: Weak]. The SIU considers repeated dilation/DVIU less cost-effective than EPA.

The guidelines diverge on their recommendations for longer bulbar strictures. In the AUA and EAU guidelines there is no role for endoscopic management, while SIU does allow for endoscopic intervention. Additionally, SIU recommends EPA in longer (> 2–4 cm) strictures in proximal bulbar strictures due to favorable tissue characteristics, in contrast with distal bulbar and penile strictures [SIU: B]. However, for long (> 2 cm) distal bulbar strictures, SIU suggests augmentation surgery if a tension-free anastomotic repair is not feasible, although it may be less successful compared with EPA [SIU: B]. Finally, in the case of failed urethroplasty, the use of buccal mucosa for redo reconstruction provides a favorable patency rate [EAU: Strong].

EAU further elaborates upon techniques. Graft urethroplasty should be considered in strictures not amenable to EPA or ntEPA repair [EAU: Strong]. In case of a short nearly-obliterative stricture lying inside the whole narrowed segment, augmented anastomotic repair is the procedure of choice [EAU: Weak]. Staged urethroplasty should be offered to complex anterior strictures not amenable to single state urethroplasty and those in doubt between perineal urethrostomy and reconstructive surgery [EAU: Weak].

Table 2 An overview of recommendations for the management of urethral strictures

	Shared	AUA	SIU	EAU
Endoscopic treatment				
General statements	Dilation and DVIU have equal efficacies[III,B]	Catheter removal within 72 h following uncomplicated dilation/DVIU[III]	Dilation/DVIU is not recommended as 1st line therapy for children A	Do not use dilatation/DVIU as solitary treatment for long (> 2 cm) strictures[S] Use post-DVIU intralesional injections for research purposes only[W]
Technique	Hot- or cold-knife urethrotomy techniques could be performed interchangeably [A,W]	–	–	Prefer visually controlled dilatation to blind dilatation[W]
(Repeated) endoscopic treatment vs. urethroplasty	⊥ Offer urethroplasty following second failed dilation/DVIU[A,S] For non-urethroplasty candidates, ISD after dilation/DVIU is recommended [II,B,W]	⊥ Offer urethroplasty following first failed dilation/DVIU[II]	Offer urethroplasty in strictures recurring within six months[A] Repeated endoscopic treatments may complicate definitive urethroplasty[B]	Use intra-urethral corticosteroids in addition to ISD[W]
Urethroplasty				
	Guidelines agree on offering urethroplasty in appropriately counseled patients who meet indications	Refer patients to surgeons with expertise for urethroplasty[IV]	Transection of the corpus spongiosum during a primary substitution surgery does not worsen outcome[B] The risks of ED, post-micturition dribble, chordee, and sacculation are not in contradiction to EPA [B]	Recommendations are location/technique-specific (covered below)

AUA American Urologic Association; *EAU* European Association of Urology; *SIU* Société Internationale d'Urologie; *DVIU* direct vision internal urethrotomy; *ISD* intermittent self-catheterization; *EPA* excision and primary anastomosis; *ED* erectile dysfunction. – no specific recommendation

[W]Weak recommendation (EAU)

[S]Strong recommendation (EAU)

[A]Recommendation strength A (SIU)

[B]Recommendation strength B (SIU)

[II]Moderate recommendation (AUA)

[III]Conditional recommendation (AUA) [IV] expert opinion (AUA)

⊥ Denotes significantly opposing statements in a row

Table 3 Summary of recommendations on the management of bulbar strictures

	Shared	AUA	SIU	EAU
Short*				
Initial Treatment	*Non-obliterative:* Dilation/DVIU[A,W] ⊥ *(nearly) Obliterative:* EPA (esp. if trauma-related)[A,S]	⊥ Initial dilation/DVIU or urethroplasty (obliterative or none) [III]	–	–
Endoscopic Treatment	–	–	Repeated endoscopic treatment is not cost-effective compared with EPA[A] Repeat dilation/DVIU if stricture recurs after three months[B] Third dilation/DVIU only for non-urethroplasty candidates[A]	Dilation/DVIU for post-urethroplasty recurrence[W]
Urethroplasty (techniques)	EPA, ntEPA preferred	–	⊥ EPA preferred (children and adults)[A] Perform EPA if other modalities are expected to succeed < 90%[A]	⊥ ntEPA or graft urethroplasty preferred to EPA if not trauma-related[W]
Long*				
Initial Treatment	–	⊥ Perform urethroplasty initially[II]	⊥ Perform dilation/DVIU as first-line[C]	–
Urethroplasty (techniques/materials)	EPA, ntEPA preferred. Tissue substitution reserved for stricture not amenable to EPA Staged urethroplasty for stricture not amenable to single stage Ventral, lateral, dorsal, or combined approaches to substitution surgery have equal efficacies[A,S] Avoid tubularized grafts	–	EPA is more successful in proximal bulb[B]	*If not amendable to EPA:* Graft urethroplasty preferred[S] Augmented anastomotic repair for strictures with a short, nearly obliterative segment within the whole stricture[W] Oral mucosa graft urethroplasty for redo urethroplasty[S]

AUA American Urologic Association; EAU European Association of Urology; SIU Société Internationale d'Urologie; EPA excision and primary anastomosis; ntEPA non-transecting excision and primary anastomosis; DVIU direct-vision internal urethrotomy

*AUA & SIU: < 2 cm; EAU: < 2–3 cm

[W]Wak recommendation (EAU)

[S]sStrong recommendation (EAU)

[A]Recommendation strength A (SIU)

[B]Recommendation strength B (SIU)

[C]Recommendation strength C (SIU)

[II]Moderate recommendation (AUA)

[III]Conditional recommendation (AUA)

⊥ Denotes significantly opposing statements in a row

– No specific recommendation

Penile strictures

There is a significant discrepancy in the guidelines on the initial management of penile stricture (Table 4). SIU recommends dilation/DVIU for short penile strictures, while both EAU and AUA recommend against endoscopic treatment. For long segment penile stricture, guidelines agree that patients should primarily be offered urethroplasty. Technically, anastomotic urethroplasties (EPA or ntEPA) should not be considered in patients with penile strictures longer than 1 cm due to the risk of chordee as a complication [EAU: Strong]. Alternatively, either single-stage or staged augmentation urethroplasty should be performed with respect to prior interventions and characteristics of the stricture [EAU:

Table 4 Summary of recommendations on the management of penile strictures

	Shared	AUA	SIU	EAU
Endoscopic treatment	⊥ Avoid endoscopic treatment[II,S]	–	⊥ Perform dilation/DVIU as first-line therapy [C]	–
Urethroplasty	Avoid EPA for long strictures (SIU: > 2 cm; EAU: > 1 cm)[B,S]	–	Perform urethroplasty primarily for multiple strictures with full obstruction[B] For children, perform EPA; if not feasible, use buccal/mucosal/skin grafts[A] ⊥ Prefer two- to single-stage substitution surgery[B] with use of an onlay flap[B]	⊥ Offer single-/multiple-stage augmentation surgery[S] Warn patients that single-stage procedures might be converted to staged ones intraoperatively[S] Offer an interval of at least four to six months between the stages[W]
(Failed) hypospadias repair	–	–	Perform open repair for hypospadias strictures[B]	Refer FHR patients to specialist centers[W] Propose psychological/psychosexual counseling to FHR cases with unsatisfactory cosmesis and sexual/urinary dysfunction [W] Avoid penile skin grafts/flaps in FHR patients with LS or scarred skin [S]
Lichen sclerosus	Avoid genital skin for reconstruction[I,A,S] Use oral mucosa for reconstruction[A,W]	–	Use the term lichen sclerosus over balanitis xerotica obliterans (BXO)[A] Consider short-term topical corticosteroids in patients with early stages[A] Circumcise in lesions confined to the foreskin/glans [A] Avoid using bladder/colonic mucosa for lengthy augmentation[C] Offer long-term follow-up in persistent LS cases to screen for malignant transformation[B]	Perform single-stage substitution surgery [W]
Meatal/fossa navicularis strictures	⊥ Avoid dilation and offer primary meatoplasty[A,W]	⊥ Initially perform dilation/meatotomy[V] & Reserve meatoplasty for recurrent cases [I]	An initial meatotomy is acceptable[A]	In women, perform meatotomy/meatoplasty[W]

AUA American Urologic Association; *EAU* European Association of Urology; *SIU* Société Internationale d'Urologie; *EPA* excision and primary anastomosis; *DVIU* direct-vision internal urethrotomy; *FHR* failed hypospadias repair; *LS* lichen sclerosus. – no specific recommendation

[W]Weak recommendation (EAU)

[S]Strong recommendation (EAU)

[A]Recommendation strength A (SIU)

[B]Recommendation strength B (SIU)

[C]Recommendation strength C (SIU)

[I]Strong recommendation (AUA)

[II]Moderate recommendation (AUA)

[V]Clinical principle (AUA)

⊥ Denotes significantly opposing statements in a row

Strong]. SIU recommends staged repair noting single-stage substitution urethroplasty tends to be less successful [SIU: B]. Patients undergoing single-stage urethroplasty should be informed that further stages may be necessary based on intra-operative findings [EAU: Strong]. If a staged approach is being considered, an interval of four to six months should be offered, assuming that the first stage is successful [EAU: Weak]. SIU suggests an onlay flap technique for augmentation urethroplasty in penile strictures [SIU: B].

(Failed) hypospadias repair

Children with a stricture following hypospadias should be treated with primary open repair [SIU: B]. Correction of failed hypospadias repair (FHR), however, is complex and the patients should be referred to specialized centers for treatment [EAU: Weak] and counseled psychologically/psychosexually in case of poor cosmetic and/or sexual function as well as urinary dysfunction [EAU: Weak]. Penile skin grafts/flaps should be avoided if FHR is concomitant with lichen sclerosus (LS) or scarred skin [EAU: Strong].

Lichen sclerosus

SIU firmly discourages using the term balanitis xerotica obliterans [SIU: A]. The diagnosis of LS may be confirmed by biopsy [AUA: Clinical principle], and topical corticosteroids and circumcision could be recruited in the early stages [SIU: A]. Guidelines agree on avoiding the use of genital skin in reconstruction for LS patients. As per EAU, single-stage augmentation with oral mucosal graft should be considered for the correction of LS-related strictures [EAU: Weak]. However, AUA and SIU do not give guidance on optimal graft location. Moreover, according to SIU, bladder or colonic mucosa should not be applied for lengthy augmentations due to the need for invasive harvesting [SIU: C]. Finally, patients with LS should have extended follow up to screen for potential malignant transformations [SIU: B], and a biopsy must be performed if suspected [AUA: Clinical principle].

Meatal/fossa navicularis strictures

AUA suggests primary treatment with meatotomy or dilation for strictures in meatus or fossa navicularis with urethroplasty reserved for recurrence [AUA: Clinical practice/Moderate]. SIU discourages initial dilations due to the need to repeat the procedure in the long-term [SIU: A]. In contrast with the other two, the EAU does not mention meatotomy or dilation for meatal/fossa navicularis strictures and directly recommends meatoplasty/urethroplasty [EAU: Weak]. Female meatal/fossa navicularis strictures should be treated with meatotomy and/or meatoplasty [EAU: Weak].

Penobulbar (panurethral/multi-segment) strictures

Guidelines agree that patients with penobulbar strictures are considered complex cases and should be advised to undergo surgical repair in specialized centers due to the need for different materials and a combination of techniques [EAU: Weak], namely one-/multi-stage reconstruction with oral mucosal grafts and/or penile fasciocutaneous flaps [AUA: Moderate].

Urethrostomy

Perineal urethrostomy could be offered to patients unfit/hesitant to undergo urethroplasty [AUA: Conditional; EAU: Weak] and men with complex anterior strictures [EAU: Strong]. The approach to urethrostomy should be based on the surgeon's expertise as well as patient characteristics [EAU: Weak]. SIU does not provide any recommendations for urethrostomy.

Stenting

The guidelines generally oppose the use of urethral stenting. However, SIU suggests permanent stent placement for patients with short and recurrent bulbar urethra strictures unfit for reconstruction and hesitant to ISD [SIU: B]. Simultaneously, EAU recommends temporary stenting in these cases [EAU: Weak] and strongly discourages stenting for penile strictures [EAU: Strong]. AUA does not provide guidelines on the urethral stents as their use is not approved in the US.

Special circumstances

Dilation to 30–41 Fr should be considered first-line treatment for women with urethral stricture [EAU: Weak]. If recurrent, repeated dilation combined with weekly ISD with a 16–18 Fr catheter is suggested [EAU: Weak]. Clinicians could consider urethroplasty after the second recurrence or in patients hesitant to ISD or willing to undergo definitive treatment [EAU: Strong]. However, the surgeon must determine the technique and the material [EAU: Strong].

For transgender patients with urethral strictures, endoscopic treatment or urethroplasty must be avoided within 6 months of neophalloplasty [EAU: Strong]. EAU does not recommend more than two endoscopies in trans men except for palliative purposes [EAU: Strong]. If urethroplasty is indicated, staged reconstruction is the procedure of choice in neophallic urethral strictures [EAU: Weak]. Finally, for short (< 1 cm) meatal stenosis in trans women, Y-V meatoplasty should be performed [EAU: Weak].

Follow-up

The EAU provides more granularity in stricture follow-up than the AUA and SIU guidelines. A risk-adjusted follow-up (for at least a year) should be offered to patients undergoing urethroplasty [EAU: Strong], and they should be monitored to identify symptoms of recurrence [AUA: Expert opinion; SIU: A]. The EAU and SIU recommend PROM, and the SIU recognizes uroflowmetry as a helpful modality to identify patients at the risk of stricture recurrence [SIU: A; EAU: Strong]; however, SIU suggests these measures should be more developed [SIU: A]. Moreover, the sexual/ejaculatory function of the patients undergoing reconstructive surgeries should be evaluated by the use of validated tools [EAU: Strong], namely IIEF and MSHQ questionnaires [SIU: C]. Cystoscopy or RUG could be implemented to evaluate the success of urethroplasty surgery in terms of anatomy [EAU: Weak] and stricture recurrence [SIU: A]. Further, EAU guidelines offer recommendations for post-urethroplasty catheter removal for the first time – a minimum of 7 days with urethrography [EAU: Strong].

Discussion

At present, conflicting evidence exists on the superiority of DVIU to dilation and hot- to cold-knife DVIU or vice versa. Further, there is no study on the long-term prognosis of patients with asymptomatic strictures. Due to limited evidence, the guidelines cannot recommend the implementation of nerve-/muscle-sparing bulbar urethroplasty, and predictors of failure after staged urethroplasty are not fully understood. Future studies could clarify the outcomes of EPA (transecting and non-transecting) for straddle injury. The management choice for penile stricture (specifically when LS-related) is not specified by the guidelines and is an area of active investigation. Patency rate after single-stage and staged urethroplasty for FHR are also potential subjects for research. Finally, the role of augmented DVIU/Dilation including the use graft tissue, stem cells, and other adjuvant medications will likely play an emerging role in reconstruction and future guidelines.

Conclusions

EAU guidelines offer increased specificity, particularly for technique and previously unmentioned patients (e.g., female and transgender stricture disease). SIU guidelines allow for a much more significant role of endoscopic management, including recurrent, long segment, and penile strictures. SIU and EAU also allow for urethral stenting, which is not approved in the US. Significant concordance is seen between the guidelines on index patients, including traumatic bulbar strictures and strictures not amenable to surgical intervention. In cases where there is conflict between guidelines, we would remind readers that the EAU are published most recently and therefore may include the most up to date evidence. Guideline statements have become more inclusive but will require further research to improve the level of evidence and continue to provide patients and providers with the best treatment plans.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s00345-022-03988-3.

Author contributions BA Project development, data collection, manuscript writing. NMS Project development, manuscript editing. JLL Manuscript editing. KDL Manuscript editing. PL Manuscript editing. NH Manuscript editing. BN Manuscript editing. BNB Protocol/project development, manuscript editing.

Funding No funding was received for conducting this study.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Research involving human participants and/or animals This study does not contain any human participants and/or animals.

Informed consent Our study does not contain human subjects.

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