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001IC – A Guidelines Approach to Complex Urethral Stricture Disease

Friday, May 15

Faculty

Alex J. Vanni, MD

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Syllabus: A Guidelines Approach to Complex Urethral Stricture Disease

Course Title: A Guidelines Approach to Complex Urethral Stricture Disease

Instructor: Alex J. Vanni, MD
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Course Overview:

This course provides an evidence-based framework for evaluating and managing complex urethral stricture disease, focusing on a guideline-driven approach including surgical techniques, patient selection, and emerging technologies.

Learning Objectives:

1. Describe the complete evaluation of a new stricture patient, male or female, and interpret the relevant diagnostic tests.

2. Identify situations in which immediate dilation or suprapubic cystotomy is indicated before formal workup and treatment.

3. Determine appropriateness of adjunctive local drug delivery technologies post-endoscopic treatment.

4. Evaluate risks and benefits of endoscopic, robotic, and open reconstruction of vesicourethral anastomotic stricture.

5. Apply a consistent precision approach to bulbar urethroplasty

6. Evaluate risks and benefits of endoscopic, robotic, and open reconstruction of vesicourethral anastomotic stricture.

7. Understand indications and techniques for perineal urethrostomy

Instructor

Alex Vanni, MD, FACS
Professor of Urology
Lahey Hospital and Medical Center

Key Topics:

• Fossa navicularis and penile urethral strictures

    - Surgical techniques including one-stage, two-stage, and overlapping graft procedures
    - Use of oral mucosa grafts (buccal vs. lingual)
- Case Discussions:
    - Case 1: LS Fossa Navicularis Stricture management options and outcomes
    - Case 2: Post-TURP urethral stricture and decision-making
- Perineal urethrostomy indications and outcomes

#18a. Surgeons may offer perineal urethrostomy as a long-term treatment option to patients as an alternative to urethroplasty. (Conditional recommendation; Evidence Strength Grade C)

#18b. Surgeons should offer perineal urethrostomy as a long-term treatment option to patients as an alternative to urethroplasty in patient populations at high risk for failure of urethral reconstruction (Expert Opinion)

When to Consider Perineal Urethrostomy?

- Recurrent stricture after failed prior reconstruction
- Seated voiding
- Buried penis
- Multiple comorbidities
- Complex penile strictures (LS, reoperative hypospadias)
- Poor access to urologic care
- Urinary continence status (caution in SUI pts)
- Advanced age

Guideline Highlights:
- Avoid use of genital skin in LS-related strictures
- Buccal and lingual mucosa as equivalent grafts
- Success rates and morbidity from graft donor sites
- Long-term outcomes of perineal urethrostomy

Instructor

Keith Rourke, MD
Professor of Urology
UC Irvine

A Guidelines Approach to Complex Urethral Stricture Disease: Outline (Keith Rourke)

- Acute Management
- Bulbar Urethral Strictures

Session Objectives - At the end of this session, the learner will be able to:

1. Apply the indications and treatments for acute management of urethral stricture associated complications
2. Formulate an evidence-based framework for the treatment of bulbar urethral stricture
3. Recognize the clinical and patient related factors that influence urethral stricture treatment outcomes

The Patient Journey (Part 1): 39-year-old male referred with progressive LUTS over 3 years, terminal dysuria and 1 episode of transient gross hematuria. He does not recall any trauma. Physical examination is unremarkable, bladder non-palpable, no meatal stenosis. Urinalysis: 3-5 WBC/HPF, Urine Culture negative. Creatinine normal. Uroflowmetry: Qmax 10 mL/sec, PVR 105 ml. What are the next steps?

Symptoms of Urethral Stricture (AUA Guideline Statement 1): Clinicians should include urethral stricture in the differential diagnosis of patients who present with decreased urinary stream, incomplete emptying, dysuria, urinary tract infection, and after rising post-void residual. (Moderate Recommendation; Evidence Level: Grade C)

Key Points: Urethral stricture encompasses a broad spectrum of symptoms other than LUTS including genitourinary pain, UTI, gross hematuria, ejaculatory dysfunction, and incontinence.

Diagnosis of Urethral Stricture (AUA Guideline Statement 3): Clinicians should use urethro-cystoscopy, retrograde urethrography, voiding cystourethrography, or ultrasound urethrography to make a diagnosis of urethral stricture. (*Moderate Recommendation; Evidence Level: Grade C*)

Staging of Urethral Stricture (AUA Guideline Statement 4): Clinicians planning non-urgent intervention for a known stricture should determine the length and location of the urethral stricture. (*Expert Opinion*)

Key Points: Distinguishing diagnosis from staging investigations. Cystoscopy confirms a stricture in a binary manner, whereas RUG +/- VCUG defines length and location for

treatment planning. While the AUA guideline does not imply superiority of any investigation, cystoscopy may detect recurrent or evolving stricture before uroflowmetry changes or overt symptoms develop and is likely the most accurate diagnostic tool for stricture detection.

Patient Journey (Part 2): The patient then presents to the local emergency room with acute urinary retention (PVR urine 540 ml) and two failed attempts at placing a urethral catheter.

Key Points: Urethral stricture can frequently be a morbid condition with ~40% of patients experiencing an acute complication requiring emergent intervention including acute urinary retention, urethral injury due to difficult catheterization, hematuria, renal failure, urethral abscess/urosepsis, and rarely urethral cancer.

Acute Management of Urethral Stricture (AUA Guideline Statement 5): Surgeons may utilize urethral endoscopic management (e.g., urethral dilation, direct visual internal urethrotomy) or immediate suprapubic cystostomy for urgent management of urethral stricture, such as discovery of symptomatic urinary retention or need for catheterization prior to another surgical procedure. (*Expert Opinion*)

Key Points: Urgent management options include endoscopic treatment (dilation or DVIU) or immediate suprapubic cystostomy when retention or urgent catheterization failure is required. Suprapubic catheterization is especially useful for impassable strictures, catheter-dependent patients, rapidly recurrent strictures awaiting staging or surgery, complex posterior stenosis assessment, and acute urethral trauma.

"Urethral Rest" (AUA Guideline Statement 6): Surgeons may place a suprapubic cystostomy to promote “urethral rest” prior to definitive urethroplasty in patients dependent on an indwelling urethral catheter or intermittent self-dilation. (Conditional Recommendation; Evidence Level: Grade C)

Key Points: Before staging investigations or urethroplasty, it is prudent to avoid further urethral instrumentation for at least 6 weeks when possible to allow 'urethral rest' for accurate delineation of stricture length and location.

Follow-up After Intervention (AUA Guideline Statement 33): Clinicians should monitor urethral stricture patients to identify symptomatic recurrence following dilation, direct visual internal urethrotomy, or urethroplasty. (Expert Opinion)

Patient Journey (Part 3): The patient undergoes emergent dilation but returns in 4 months with recurrent LUTS (IPSS 19), Qmax 9 ml/sec and a retrograde urethrogram is performed delineating a 2 cm bulbar urethral stricture.

Initial Urethroplasty for Strictures ≥2cm (AUA Guideline Statement 16): Surgeons should offer urethroplasty as the initial treatment for patients with long (≥2cm) bulbar urethral strictures given the low success rate of direct visual internal urethrotomy or dilation (Moderate Recommendation; Evidence Level: Grade C)

Key Points: It is reasonable to offer urethroplasty as initial therapy for long (≥2 cm) bulbar urethral strictures given the poor success and lack of durability for endoscopic treatments in this setting. Urethroplasty as an initial treatment is generally also favored for strictures with high recurrence risk such penile urethral strictures, post-acute trauma (straddle or pelvic fracture urethral injury), or complete obliteration

Urethroplasty after Failed Endoscopic Treatment (AUA Guideline Statement 11a): Surgeons should offer urethroplasty, instead of repeated endoscopic management for recurrent anterior urethral strictures following failed dilation or direct visual internal urethrotomy (Moderate Recommendation; Evidence Level: Grade C)

Key Points: Repeat endoscopic treatments alone generally perform poorly in the setting of recurrent stricture and may increase stricture length, complexity, and subsequent urethroplasty difficulty. Similarly, intermittent self-catheterization offers temporarily relief as long as dilations are performed. The OPEN randomized controlled trial was a pragmatic, multicenter, open-label UK study that randomized 222 men with recurrent bulbar urethral stricture to either repeat endoscopic urethrotomy or open urethroplasty and followed them for 24 months. The trial found that both procedures improved voiding symptoms, but urethroplasty provided more durable disease control, as men assigned to urethroplasty were about half as likely to require further intervention for recurrent stricture during follow-up. Serious adverse events were uncommon in both groups. However, repeat endoscopic treatment ay be appropriate for poor urethroplasty candidates (comorbidities, etc.) or select short (<2cm) bulbar strictures with “durable” response.

Drug Coated Balloon for Recurrent Bulbar Strictures <3cm (AUA Guideline Statement 11b): Surgeons may offer urethral dilation or direct visual internal urethrotomy, combined with drug-coated balloons, for recurrent bulbar urethral strictures <3cm in length (Conditional Recommendation; Evidence Level: Grade B)

Key Points: Drug-coated balloon dilation may be considered for recurrent bulbar strictures <3 cm in length. Drug-coated balloon dilation (Optilume) design delivers highly lipophilic drug, paclitaxel, limits hyperactive cell proliferation and the fibrotic scar tissue generation that results in stricture recurrence. Clinical trial (ROBUST III) required either dilation or DVIU prior to DCB deployment. Maximum balloon length is 5 cm (3cm or 5 cm) with balloon diameters of 18Fr, 24Fr, 30Fr. Apply balloon for 5 – 10 minutes with a urethral catheter for 3-5 days after. Results improved with drug coated balloon when compared to control. The course reviews Optilume/ROBUST data, including short- and intermediate-term anatomic success and freedom from repeat intervention. Adverse events from the ROBUST III trial included dysuria (8.9%), post-Procedural Hematuria (11.4%) and urinary tract infection (11.4%). Although DCB is approved by the FDA for anterior urethral strictures, the trial was not powered to assess results in penile urethral strictures. Best-fit use case is selected recurrent short bulbar strictures in patients who are not ideal urethroplasty candidates or who prefer a less invasive option after counseling. Important limitation of DCB is longer strictures, dense obliteration, or anatomy beyond device length constraints. However, the generalizability and indications are evolving. It is not clear if failed drug coated balloon dilation increases urethroplasty complexity.

Urethroplasty for Short (1-2 cm) Bulbar Urethral Stricture: Anastomotic urethroplasty also known as excision and primary anastomosis remains a highly effective treatment for short bulbar urethral strictures, with long-term success commonly reported around over 90% and systematic reviews suggesting this technique provides the highest efficacy overall for short bulbar urethral strictures. The morbidity after anastomotic urethroplasty is generally low with occasional complications including hematoma (1%), wound Infection (1-3%), urinary tract infection (2-4%), chordee (1-2%), “scrotalgia” beyond 6 weeks (1-2%), or positional neurapraxia (2-3%). Clavien ≥2 complications are uncommon ~8% and any donor site morbidity is avoided. Historically, anastomotic urethroplasty was performed with complete transection of the corpus spongiosum. Beginning in 2007, there was a central debate as to whether urethral transection contributed to penile complications or sexual dysfunction such as adverse change in glans sensitivity or engorgement despite high patient satisfaction (~97%) (Barbagli et al. 2007). Results from the Scandinavian multicentre randomized study of bulbar urethroplasty comparing transecting anastomotic urethroplasty versus substitution buccal mucosal grafting found significant negative impact of transection on glans rigidity,

sensation and perceived penile curvature/foreshortening with no difference in success or erectile dysfunction.In response to these potential concerns, non-transecting anastomotic approaches were developed aiming to preserve spongiosal integrity and urethral vascularity while maintaining reconstructive efficacy in selected cases. Several multi-institutional studies have suggested that non-transecting anastomotic techniques can reduce the risk of adverse events after urethroplasty while avoiding the risk of donor site morbidity. While still often a surgeon preference, it is important to avoid urethral transection when urethral vascularity may already be compromised, such as in hypospadias, prior distal urethroplasty, synchronous strictures, post-prostatectomy stenosis with potential future continence surgery, penile prosthesis, or prior priapism. Transection remains appropriate when there is full-thickness spongiofibrosis, particularly after straddle injury or focal obliterative disease. The course frames this as a patient-specific decision balancing tissue quality, blood supply, fibrosis severity, downstream reconstructive needs. And technical considerations when helping patients decide between DCB and urethroplasty.

Longer (>2 cm) Bulbar Urethral Strictures

AUA Guideline Statement 19a: Surgeons should use oral mucosa as the first choice when using grafts for urethroplasty. (Expert Opinion)

AUA Guideline Statement 19b: Surgeons may use either buccal or lingual mucosal grafts as equivalent alternatives. (Strong Recommendation; Evidence Level: Grade A)

Key Points: When stricture characteristics preclude reconstruction using an anastomotic technique, buccal mucosal grafts (BMG) are considered the gold standard source for tissue transfer. Buccal mucosa is particularly well suited for urethroplasty. The epithelium is adapted to a wet environment and also has a highly vascular pan-laminar plexus that facilitates rapid inosculation which improves reliability of graft take even in challenging recipient beds. Moreover, ample oral mucosa is usually available and graft harvest technique is typically straightforward. Clinically, buccal mucosal grafts have consistently shown high success in establishing long-term stricture-free status across a wide range of stricture etiologies, locations, and techniques with reproducibility across surgeons. Buccal mucosal graft is especially useful for longer bulbar strictures, penile strictures, inflammatory disease, and re-operative cases where anastomotic repair may not be achievable due to loss of urethral elasticity. While, buccal mucosa is the most common graft source, current evidence does not clearly show superiority of dorsal over ventral onlay overall. However, there are some key differences. Dorsal onlay offers broad anatomic versatility for any bulbar urethral location, purposeful graft quilting/spread fixation, and less dependence on spongiosal quality. Ventral onlay requires less urethral dissection but depends on a healthy urethral plate and robust corpus spongiosum for urethroplasty success. When complete obliteration is

encountered during bulbar urethroplasty, augmented anastomosis with buccal graft can be used for focal obliteration within a longer bulbar stricture and short segments (<2 cm) of obliteration. When longer segments of obliteration are encountered, "double-faced" circumferential reconstructions can be employed with placement of buccal mucosa dorsally and ventrally through a dorsal stricturotomy (dorsal onlay with graft also placed ventrally on the spongiosum) or ventral stricturotomy (dorsal inlay combined with ventral onlay). In cases of severe spongiofibrosis in the bulbar urethra such as those encountered with revision urethroplasty, radiation, Fournier's gangrene, flaps can be used to augment the reconstruction. The course will contain discussion regarding how to approach complex strictures

Non-Autologous Tissue (AUA Guideline Statement 20):. Surgeons should not perform substitution urethroplasty with allograft, xenograft, or synthetic materials except under experimental protocols (Expert Opinion)

Use Tissue as a Patch not a Tube (AUA Guideline Statement 21): Surgeons should not perform a single stage tubularized graft urethroplasty (Expert Opinion)

Multi-segment and Panurethral Strictures (AUA Guideline Statement 17): Surgeons may reconstruct long multi-segment strictures with one-stage or multi-stage techniques using oral mucosal grafts, penile fasciocutaneous flaps, or a combination of these techniques (Moderate Recommendation; Evidence Level: Grade C)

Key Points: Long bulbar strictures >6 cm or strictures spanning both the penile and bulbar urethra, will often require more than one buccal mucosal grafts or select flap-based reconstruction using a penile fasciocutaneous flap (which can be used to reconstruct strictures up to 10-12cm in length in the absence of lichen sclerosus). The vast majority of bulbar urethral strictures can be reconstructed in a single-stage without the need for a multi-stage approach. However, stricture length is a well-documented risk factor for stricture recurrence after urethroplasty and outcomes may not be comparable to urethroplasty in other settings. Additionally, panurethral or multi-segment reconstruction can result in transient impairment of genital function until full graft maturation occurs.

Perineal Urethrostomy as a Treatment Option (AUA Guideline Statement 18a): Surgeons may offer perineal urethrostomy as a long-term treatment option to patients as an alternative to urethroplasty (Conditional Recommendation; Evidence Level: Grade C)

Key Point: Perineal urethrostomy should be discussed as a legitimate long-term option, especially in patients after failed urethroplasty, significant comorbidities, or patients at high risk of reconstructive failure. However, in order to avoid recurrent stenosis after surgery ensure the urethral segment proximal to the urethrostomy is normal or address any potential pathology with buccal mucosa during reconstruction of the perineal urethrostomy. It is advisable to avoid perineal urethrostomy in patients with urinary incontinence, managing incontinence in this situation can be problematic.

Complex Cases of Bulbar Urethral Strictures: While urethroplasty is the de facto gold standard with long-term stricture-free rates exceeding 85% in high-volume centers, it is not exempt from stricture recurrence and post-operative complications. Increasing stricture length, prior surgery, lichen sclerosus, infectious strictures, obesity and patient comorbidities increase the risk of stricture recurrence after surgery. Urethroplasty is more complex in the setting of revision surgery, extensive peri-urethral fibrosis, radiation effects, poor vascularity or with very long, synchronous or obliterated strictures. Complex urethroplasty in these settings requires an in-depth understanding of prior treatment, patient specific anatomy, underlying mechanisms of surgical failure, and a global understanding of reconstructive principles and techniques.

Summary Points:

- For the binary diagnosis of urethral stricture, cystoscopy is likely most accurate but staging of stricture length and location requires retrograde urethrogram +/- voiding cystourethrogram
- Acutely, endoscopic treatment or suprapubic catheter insertion are appropriate
- Consider urethral rest with a suprapubic catheter for rapidly recurrent stricture, concern of more proximal urethral pathology or patients within 6 weeks of definitive staging or treatment
- Repeat endoscopic treatments are ineffective and may increase stricture complexity
- Drug coated balloon currently indicated for bulbar urethral stricture <3cm but role evolving
- Urethroplasty continues to be the gold-standard for the majority of recurrent urethral strictures
- Most patients with recurrent bulbar stricture can be treated with a single-stage reconstruction
- Non-transecting techniques may reduce the risk of sexual dysfunction and adverse genital outcomes
- Urethroplasty is more complex in the setting of revision surgery, extensive peri-urethral fibrosis, radiation effects, poor vascularity or with very long, synchronous or obliterated strictures.
- Perineal urethrostomy is a salvage option provided there is an awareness of more proximal urethral pathology and recurrence risk for panurethral lichen sclerosus strictures

Instructor:

Dr. Jill Buckley, MD, MBA FACS
Professor of Urology, University of California San Diego
Director of GURS Fellowship

Learning Objectives:
1. Evaluate male and female urethral stricture patients and interpret relevant diagnostic tests.
2. Discuss management strategies for bladder neck contractures (BNC) and vesicourethral anastomotic strictures (VUAS), including endoscopic, open, and robotic approaches.
3. Explore different treatment options for female urethral strictures and assess their outcomes.

Course Content and Structure

Introduction to Urethral Strictures
• Definition and prevalence of urethral strictures in male and female patients.
• Clinical presentation and impact on quality of life.
• Overview of treatment goals: symptom relief, preservation of continence, and prevention of recurrence.

Symptoms and Clinical Presentation
• Straining to urinate, prolonged urination, weak stream, urinary hesitancy, and incomplete bladder emptying.
• Urinary retention, recurrent urinary tract infections (UTIs), dysuria, and pain.
• Gender-specific differences in symptoms and diagnosis.

Diagnostic Workup for Urethral Strictures
• History-taking and physical examination.
• Patient-reported symptom measures (e.g., flow rates, post-void residual volume).
• Imaging and endoscopic techniques:
• Urethro-cystoscopy
• Retrograde urethrography (RUG)
• Voiding cystourethrography (VCUG)
• Ultrasound urethrography
• Interpretation of diagnostic results and decision-making for treatment pathways.

Male Urethral Stricture Disease
• Anatomy and etiology:
• Lichen sclerosus, hypospadias, trauma, prior catheterization or surgery.
• Radiation-induced strictures and impact of spongiofibrosis.

• Assessment of stricture location, length, and density.
• Factors influencing treatment decisions, including prior interventions and blood supply considerations.
• Review of guideline recommendations for diagnosis and management.

Treatment Approaches for Male Urethral Strictures
• Endoscopic interventions:
• Direct vision internal urethrotomy (DVIU)
• Urethral dilation (success rates and recurrence risk)
• Open surgical reconstruction:
• Excision and primary anastomosis
• Buccal mucosal graft (BMG) urethroplasty
• Skin flap urethroplasty
• Comparison of treatment modalities based on long-term success rates and patient outcomes.

Female Urethral Stricture Disease
• Rarity and challenges in defining female urethral strictures.
• Key diagnostic tools: history, physical exam, imaging, functional testing, and cystoscopy.
• Case-based discussions:
• 54-year-old female with severe LUTS, prior dilations, and bladder trabeculations.
• Decision-making for urethral dilation vs. surgical repair.

Management of Female Urethral Strictures
• Efficacy of different treatment options:
• Urethral dilation (49% success rate at 32 months)
• Flap urethroplasty (92% success at 423 months)
• Buccal mucosal graft (BMG) urethroplasty (89% success at 19 months)
• Surgical approaches:
• Dorsal inlay BMG urethroplasty
• Ventral vaginal flap urethroplasty
• Factors influencing decision-making: shared decision-making, treatment-naïve strictures, and recurrence risk.

Bladder Neck Contractures (BNC) and Vesicourethral Anastomotic Stenosis (VUAS)
• Etiology and risk factors:
• Post-TURP, post-prostatectomy, radiation effects.
• Symptomatology and diagnostic approach:
• Straining, nocturia, difficulty urinating, retention.
• Case-based discussion:
• 75-year-old male with prior DVIUs and good urinary control.
• 68-year-old male with history of prostate cancer, radiation, and urinary retention.

Endoscopic and Surgical Management of BNC/VUAS

- Endoscopic interventions:
- Bladder neck incision (BNI)
- Transurethral resection for BNC
- Dilation techniques and repeated treatment considerations
- Adjunctive use of Mitomycin-C (conflicting evidence)
- Open and robotic reconstruction:
- Indications for robotic vs. open reconstruction.
- Success rates (77%-100%) and impact on urinary continence.
- Risk of post-operative incontinence:
- Retropubic approach: 10%
- Perineal approach: 83.3%

Surgical Techniques for Refractory Cases

- Reconstructive techniques for recalcitrant BNC/VUAS.
- Considerations for patient selection and long-term outcomes.
- Video demonstrations of surgical procedures.

Emerging Techniques and Future Directions

- Role of novel therapies and adjunctive agents.
- Decision-making frameworks in complex cases.
- Gaps in current research and areas for future investigation.

Syllabus: A Guidelines Approach to Complex Urethral Stricture Disease

Course Title: A Guidelines Approach to Complex Urethral Stricture Disease

Instructor: Alex J. Vanni, MD
Contact: Alex.j.vanni@lahey.org

Course Overview:

This course provides an evidence-based framework for evaluating and managing complex urethral stricture disease, focusing on a guideline-driven approach including surgical techniques, patient selection, and emerging technologies.

Learning Objectives:

1. Describe the complete evaluation of a new stricture patient, male or female, and interpret the relevant diagnostic tests.

2. Identify situations in which immediate dilation or suprapubic cystotomy is indicated before formal workup and treatment.

3. Determine appropriateness of adjunctive local drug delivery technologies post-endoscopic treatment.

4. Evaluate risks and benefits of endoscopic, robotic, and open reconstruction of vesicourethral anastomotic stricture.

5. Apply a consistent precision approach to bulbar urethroplasty

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• Fossa navicularis and penile urethral strictures

    - Surgical techniques including one-stage, two-stage, and overlapping graft procedures
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- Case Discussions:
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- Perineal urethrostomy indications and outcomes

#18a. Surgeons may offer perineal urethrostomy as a long-term treatment option to patients as an alternative to urethroplasty. (Conditional recommendation; Evidence Strength Grade C)

#18b. Surgeons should offer perineal urethrostomy as a long-term treatment option to patients as an alternative to urethroplasty in patient populations at high risk for failure of urethral reconstruction (Expert Opinion)

When to Consider Perineal Urethrostomy?

- Recurrent stricture after failed prior reconstruction
- Seated voiding
- Buried penis
- Multiple comorbidities
- Complex penile strictures (LS, reoperative hypospadias)
- Poor access to urologic care
- Urinary continence status (caution in SUI pts)
- Advanced age

Guideline Highlights:
- Avoid use of genital skin in LS-related strictures
- Buccal and lingual mucosa as equivalent grafts
- Success rates and morbidity from graft donor sites
- Long-term outcomes of perineal urethrostomy

Instructor

Keith Rourke, MD
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A Guidelines Approach to Complex Urethral Stricture Disease: Outline (Keith Rourke)

- Acute Management
- Bulbar Urethral Strictures

Session Objectives - At the end of this session, the learner will be able to:

1. Apply the indications and treatments for acute management of urethral stricture associated complications
2. Formulate an evidence-based framework for the treatment of bulbar urethral stricture
3. Recognize the clinical and patient related factors that influence urethral stricture treatment outcomes

The Patient Journey (Part 1): 39-year-old male referred with progressive LUTS over 3 years, terminal dysuria and 1 episode of transient gross hematuria. He does not recall any trauma. Physical examination is unremarkable, bladder non-palpable, no meatal stenosis. Urinalysis: 3-5 WBC/HPF, Urine Culture negative. Creatinine normal. Uroflowmetry: Qmax 10 mL/sec, PVR 105 ml. What are the next steps?

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Key Points: Urethral stricture encompasses a broad spectrum of symptoms other than LUTS including genitourinary pain, UTI, gross hematuria, ejaculatory dysfunction, and incontinence.

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Key Points: Distinguishing diagnosis from staging investigations. Cystoscopy confirms a stricture in a binary manner, whereas RUG +/- VCUG defines length and location for

treatment planning. While the AUA guideline does not imply superiority of any investigation, cystoscopy may detect recurrent or evolving stricture before uroflowmetry changes or overt symptoms develop and is likely the most accurate diagnostic tool for stricture detection.

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Key Points: Urethral stricture can frequently be a morbid condition with ~40% of patients experiencing an acute complication requiring emergent intervention including acute urinary retention, urethral injury due to difficult catheterization, hematuria, renal failure, urethral abscess/urosepsis, and rarely urethral cancer.

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Key Points: Repeat endoscopic treatments alone generally perform poorly in the setting of recurrent stricture and may increase stricture length, complexity, and subsequent urethroplasty difficulty. Similarly, intermittent self-catheterization offers temporarily relief as long as dilations are performed. The OPEN randomized controlled trial was a pragmatic, multicenter, open-label UK study that randomized 222 men with recurrent bulbar urethral stricture to either repeat endoscopic urethrotomy or open urethroplasty and followed them for 24 months. The trial found that both procedures improved voiding symptoms, but urethroplasty provided more durable disease control, as men assigned to urethroplasty were about half as likely to require further intervention for recurrent stricture during follow-up. Serious adverse events were uncommon in both groups. However, repeat endoscopic treatment ay be appropriate for poor urethroplasty candidates (comorbidities, etc.) or select short (<2cm) bulbar strictures with “durable” response.

Drug Coated Balloon for Recurrent Bulbar Strictures <3cm (AUA Guideline Statement 11b): Surgeons may offer urethral dilation or direct visual internal urethrotomy, combined with drug-coated balloons, for recurrent bulbar urethral strictures <3cm in length (Conditional Recommendation; Evidence Level: Grade B)

Key Points: Drug-coated balloon dilation may be considered for recurrent bulbar strictures <3 cm in length. Drug-coated balloon dilation (Optilume) design delivers highly lipophilic drug, paclitaxel, limits hyperactive cell proliferation and the fibrotic scar tissue generation that results in stricture recurrence. Clinical trial (ROBUST III) required either dilation or DVIU prior to DCB deployment. Maximum balloon length is 5 cm (3cm or 5 cm) with balloon diameters of 18Fr, 24Fr, 30Fr. Apply balloon for 5 – 10 minutes with a urethral catheter for 3-5 days after. Results improved with drug coated balloon when compared to control. The course reviews Optilume/ROBUST data, including short- and intermediate-term anatomic success and freedom from repeat intervention. Adverse events from the ROBUST III trial included dysuria (8.9%), post-Procedural Hematuria (11.4%) and urinary tract infection (11.4%). Although DCB is approved by the FDA for anterior urethral strictures, the trial was not powered to assess results in penile urethral strictures. Best-fit use case is selected recurrent short bulbar strictures in patients who are not ideal urethroplasty candidates or who prefer a less invasive option after counseling. Important limitation of DCB is longer strictures, dense obliteration, or anatomy beyond device length constraints. However, the generalizability and indications are evolving. It is not clear if failed drug coated balloon dilation increases urethroplasty complexity.

Urethroplasty for Short (1-2 cm) Bulbar Urethral Stricture: Anastomotic urethroplasty also known as excision and primary anastomosis remains a highly effective treatment for short bulbar urethral strictures, with long-term success commonly reported around over 90% and systematic reviews suggesting this technique provides the highest efficacy overall for short bulbar urethral strictures. The morbidity after anastomotic urethroplasty is generally low with occasional complications including hematoma (1%), wound Infection (1-3%), urinary tract infection (2-4%), chordee (1-2%), “scrotalgia” beyond 6 weeks (1-2%), or positional neurapraxia (2-3%). Clavien ≥2 complications are uncommon ~8% and any donor site morbidity is avoided. Historically, anastomotic urethroplasty was performed with complete transection of the corpus spongiosum. Beginning in 2007, there was a central debate as to whether urethral transection contributed to penile complications or sexual dysfunction such as adverse change in glans sensitivity or engorgement despite high patient satisfaction (~97%) (Barbagli et al. 2007). Results from the Scandinavian multicentre randomized study of bulbar urethroplasty comparing transecting anastomotic urethroplasty versus substitution buccal mucosal grafting found significant negative impact of transection on glans rigidity,

sensation and perceived penile curvature/foreshortening with no difference in success or erectile dysfunction.In response to these potential concerns, non-transecting anastomotic approaches were developed aiming to preserve spongiosal integrity and urethral vascularity while maintaining reconstructive efficacy in selected cases. Several multi-institutional studies have suggested that non-transecting anastomotic techniques can reduce the risk of adverse events after urethroplasty while avoiding the risk of donor site morbidity. While still often a surgeon preference, it is important to avoid urethral transection when urethral vascularity may already be compromised, such as in hypospadias, prior distal urethroplasty, synchronous strictures, post-prostatectomy stenosis with potential future continence surgery, penile prosthesis, or prior priapism. Transection remains appropriate when there is full-thickness spongiofibrosis, particularly after straddle injury or focal obliterative disease. The course frames this as a patient-specific decision balancing tissue quality, blood supply, fibrosis severity, downstream reconstructive needs. And technical considerations when helping patients decide between DCB and urethroplasty.

Longer (>2 cm) Bulbar Urethral Strictures

AUA Guideline Statement 19a: Surgeons should use oral mucosa as the first choice when using grafts for urethroplasty. (Expert Opinion)

AUA Guideline Statement 19b: Surgeons may use either buccal or lingual mucosal grafts as equivalent alternatives. (Strong Recommendation; Evidence Level: Grade A)

Key Points: When stricture characteristics preclude reconstruction using an anastomotic technique, buccal mucosal grafts (BMG) are considered the gold standard source for tissue transfer. Buccal mucosa is particularly well suited for urethroplasty. The epithelium is adapted to a wet environment and also has a highly vascular pan-laminar plexus that facilitates rapid inosculation which improves reliability of graft take even in challenging recipient beds. Moreover, ample oral mucosa is usually available and graft harvest technique is typically straightforward. Clinically, buccal mucosal grafts have consistently shown high success in establishing long-term stricture-free status across a wide range of stricture etiologies, locations, and techniques with reproducibility across surgeons. Buccal mucosal graft is especially useful for longer bulbar strictures, penile strictures, inflammatory disease, and re-operative cases where anastomotic repair may not be achievable due to loss of urethral elasticity. While, buccal mucosa is the most common graft source, current evidence does not clearly show superiority of dorsal over ventral onlay overall. However, there are some key differences. Dorsal onlay offers broad anatomic versatility for any bulbar urethral location, purposeful graft quilting/spread fixation, and less dependence on spongiosal quality. Ventral onlay requires less urethral dissection but depends on a healthy urethral plate and robust corpus spongiosum for urethroplasty success. When complete obliteration is

encountered during bulbar urethroplasty, augmented anastomosis with buccal graft can be used for focal obliteration within a longer bulbar stricture and short segments (<2 cm) of obliteration. When longer segments of obliteration are encountered, "double-faced" circumferential reconstructions can be employed with placement of buccal mucosa dorsally and ventrally through a dorsal stricturotomy (dorsal onlay with graft also placed ventrally on the spongiosum) or ventral stricturotomy (dorsal inlay combined with ventral onlay). In cases of severe spongiofibrosis in the bulbar urethra such as those encountered with revision urethroplasty, radiation, Fournier's gangrene, flaps can be used to augment the reconstruction. The course will contain discussion regarding how to approach complex strictures

Non-Autologous Tissue (AUA Guideline Statement 20):. Surgeons should not perform substitution urethroplasty with allograft, xenograft, or synthetic materials except under experimental protocols (Expert Opinion)

Use Tissue as a Patch not a Tube (AUA Guideline Statement 21): Surgeons should not perform a single stage tubularized graft urethroplasty (Expert Opinion)

Multi-segment and Panurethral Strictures (AUA Guideline Statement 17): Surgeons may reconstruct long multi-segment strictures with one-stage or multi-stage techniques using oral mucosal grafts, penile fasciocutaneous flaps, or a combination of these techniques (Moderate Recommendation; Evidence Level: Grade C)

Key Points: Long bulbar strictures >6 cm or strictures spanning both the penile and bulbar urethra, will often require more than one buccal mucosal grafts or select flap-based reconstruction using a penile fasciocutaneous flap (which can be used to reconstruct strictures up to 10-12cm in length in the absence of lichen sclerosus). The vast majority of bulbar urethral strictures can be reconstructed in a single-stage without the need for a multi-stage approach. However, stricture length is a well-documented risk factor for stricture recurrence after urethroplasty and outcomes may not be comparable to urethroplasty in other settings. Additionally, panurethral or multi-segment reconstruction can result in transient impairment of genital function until full graft maturation occurs.

Perineal Urethrostomy as a Treatment Option (AUA Guideline Statement 18a): Surgeons may offer perineal urethrostomy as a long-term treatment option to patients as an alternative to urethroplasty (Conditional Recommendation; Evidence Level: Grade C)

Key Point: Perineal urethrostomy should be discussed as a legitimate long-term option, especially in patients after failed urethroplasty, significant comorbidities, or patients at high risk of reconstructive failure. However, in order to avoid recurrent stenosis after surgery ensure the urethral segment proximal to the urethrostomy is normal or address any potential pathology with buccal mucosa during reconstruction of the perineal urethrostomy. It is advisable to avoid perineal urethrostomy in patients with urinary incontinence, managing incontinence in this situation can be problematic.

Complex Cases of Bulbar Urethral Strictures: While urethroplasty is the de facto gold standard with long-term stricture-free rates exceeding 85% in high-volume centers, it is not exempt from stricture recurrence and post-operative complications. Increasing stricture length, prior surgery, lichen sclerosus, infectious strictures, obesity and patient comorbidities increase the risk of stricture recurrence after surgery. Urethroplasty is more complex in the setting of revision surgery, extensive peri-urethral fibrosis, radiation effects, poor vascularity or with very long, synchronous or obliterated strictures. Complex urethroplasty in these settings requires an in-depth understanding of prior treatment, patient specific anatomy, underlying mechanisms of surgical failure, and a global understanding of reconstructive principles and techniques.

Summary Points:

- For the binary diagnosis of urethral stricture, cystoscopy is likely most accurate but staging of stricture length and location requires retrograde urethrogram +/- voiding cystourethrogram
- Acutely, endoscopic treatment or suprapubic catheter insertion are appropriate
- Consider urethral rest with a suprapubic catheter for rapidly recurrent stricture, concern of more proximal urethral pathology or patients within 6 weeks of definitive staging or treatment
- Repeat endoscopic treatments are ineffective and may increase stricture complexity
- Drug coated balloon currently indicated for bulbar urethral stricture <3cm but role evolving
- Urethroplasty continues to be the gold-standard for the majority of recurrent urethral strictures
- Most patients with recurrent bulbar stricture can be treated with a single-stage reconstruction
- Non-transecting techniques may reduce the risk of sexual dysfunction and adverse genital outcomes
- Urethroplasty is more complex in the setting of revision surgery, extensive peri-urethral fibrosis, radiation effects, poor vascularity or with very long, synchronous or obliterated strictures.
- Perineal urethrostomy is a salvage option provided there is an awareness of more proximal urethral pathology and recurrence risk for panurethral lichen sclerosus strictures

Instructor:

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Learning Objectives:
1. Evaluate male and female urethral stricture patients and interpret relevant diagnostic tests.
2. Discuss management strategies for bladder neck contractures (BNC) and vesicourethral anastomotic strictures (VUAS), including endoscopic, open, and robotic approaches.
3. Explore different treatment options for female urethral strictures and assess their outcomes.

Course Content and Structure

Introduction to Urethral Strictures
• Definition and prevalence of urethral strictures in male and female patients.
• Clinical presentation and impact on quality of life.
• Overview of treatment goals: symptom relief, preservation of continence, and prevention of recurrence.

Symptoms and Clinical Presentation
• Straining to urinate, prolonged urination, weak stream, urinary hesitancy, and incomplete bladder emptying.
• Urinary retention, recurrent urinary tract infections (UTIs), dysuria, and pain.
• Gender-specific differences in symptoms and diagnosis.

Diagnostic Workup for Urethral Strictures
• History-taking and physical examination.
• Patient-reported symptom measures (e.g., flow rates, post-void residual volume).
• Imaging and endoscopic techniques:
• Urethro-cystoscopy
• Retrograde urethrography (RUG)
• Voiding cystourethrography (VCUG)
• Ultrasound urethrography
• Interpretation of diagnostic results and decision-making for treatment pathways.

Male Urethral Stricture Disease
• Anatomy and etiology:
• Lichen sclerosus, hypospadias, trauma, prior catheterization or surgery.
• Radiation-induced strictures and impact of spongiofibrosis.

• Assessment of stricture location, length, and density.
• Factors influencing treatment decisions, including prior interventions and blood supply considerations.
• Review of guideline recommendations for diagnosis and management.

Treatment Approaches for Male Urethral Strictures
• Endoscopic interventions:
• Direct vision internal urethrotomy (DVIU)
• Urethral dilation (success rates and recurrence risk)
• Open surgical reconstruction:
• Excision and primary anastomosis
• Buccal mucosal graft (BMG) urethroplasty
• Skin flap urethroplasty
• Comparison of treatment modalities based on long-term success rates and patient outcomes.

Female Urethral Stricture Disease
• Rarity and challenges in defining female urethral strictures.
• Key diagnostic tools: history, physical exam, imaging, functional testing, and cystoscopy.
• Case-based discussions:
• 54-year-old female with severe LUTS, prior dilations, and bladder trabeculations.
• Decision-making for urethral dilation vs. surgical repair.

Management of Female Urethral Strictures
• Efficacy of different treatment options:
• Urethral dilation (49% success rate at 32 months)
• Flap urethroplasty (92% success at 423 months)
• Buccal mucosal graft (BMG) urethroplasty (89% success at 19 months)
• Surgical approaches:
• Dorsal inlay BMG urethroplasty
• Ventral vaginal flap urethroplasty
• Factors influencing decision-making: shared decision-making, treatment-naïve strictures, and recurrence risk.

Bladder Neck Contractures (BNC) and Vesicourethral Anastomotic Stenosis (VUAS)
• Etiology and risk factors:
• Post-TURP, post-prostatectomy, radiation effects.
• Symptomatology and diagnostic approach:
• Straining, nocturia, difficulty urinating, retention.
• Case-based discussion:
• 75-year-old male with prior DVIUs and good urinary control.
• 68-year-old male with history of prostate cancer, radiation, and urinary retention.

Endoscopic and Surgical Management of BNC/VUAS

- Endoscopic interventions:
- Bladder neck incision (BNI)
- Transurethral resection for BNC
- Dilation techniques and repeated treatment considerations
- Adjunctive use of Mitomycin-C (conflicting evidence)
- Open and robotic reconstruction:
- Indications for robotic vs. open reconstruction.
- Success rates (77%-100%) and impact on urinary continence.
- Risk of post-operative incontinence:
- Retropubic approach: 10%
- Perineal approach: 83.3%

Surgical Techniques for Refractory Cases

- Reconstructive techniques for recalcitrant BNC/VUAS.
- Considerations for patient selection and long-term outcomes.
- Video demonstrations of surgical procedures.

Emerging Techniques and Future Directions

- Role of novel therapies and adjunctive agents.
- Decision-making frameworks in complex cases.
- Gaps in current research and areas for future investigation.