Urethral Stricture: AUA Guidelines and Best Practice Management
Lucas R. Wiegand, MD
Disclosures

• Nothing to disclose.
Objective

• Discuss AUA Guidelines on urethral stricture disease
• Determine which patients are appropriate candidates for endoscopic treatment vs urethroplasty
What is a Urethral Stricture?

• Scar of urethral epithelium and varying degrees of spongiosal scar

• Contracts in 2 directions (lumen and length) -> obstruction of urine flow

• Causes:
  – Idiopathic
  – Iatrogenic
  – Trauma
  – Infection
Urethral Stricture Disease

• Causes:
  – Congenital
  – Infection
  – Inflammation (LSA)
  – Trauma
  – Iatrogenic
  – Idiopathic
Anatomy

Need sufficient healthy spongy tissue for urethral patency after healing. A race of spongiofibrosis/scar vs. urothelium!
Pathology

(a) 

(b) 

(c) 

(d)
Burden

- Up to 0.6% prevalence
- $200 million/year
- 1.5 million patient visits over 8 year period
- Adds $6000 per patient per year after diagnosis

Santucci, 2007
Quality of Life

• **Negatively** impacts quality of life

• **Rarely** life-threatening
  – Most patients do not end up with renal failure or sepsis

• Must balance the **potential morbidity** of treatment with patient’s expectations of long-term cure and their current quality of life
## Presenting Symptoms

Rourke and Hickle, Urology 2012

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Presenting</th>
<th>No. Patients (%) Associated</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUTS</td>
<td>332(54.3)</td>
<td>234(38.6)</td>
<td>566(92.9)</td>
</tr>
<tr>
<td>AUR</td>
<td>143(23.4)</td>
<td>39(6.4)</td>
<td>182(29.8)</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>37(6.1)</td>
<td>87(14.2)</td>
<td>124(20.3)</td>
</tr>
<tr>
<td>Difficult catheterization</td>
<td>29(4.8)</td>
<td>54(8.8)</td>
<td>83(13.6)</td>
</tr>
<tr>
<td>Gross hematuria</td>
<td>19(3.1)</td>
<td>50(8.2)</td>
<td>69(11.3)</td>
</tr>
<tr>
<td>Genitourinary pain</td>
<td>18(2.9)</td>
<td>122(20.0)</td>
<td>140(22.9)</td>
</tr>
<tr>
<td>Urethral abscess/necrotizing fasciitis</td>
<td>14(2.3)</td>
<td>6(1.0)</td>
<td>20(3.3)</td>
</tr>
<tr>
<td>Renal failure/hydronephrosis</td>
<td>8(1.3)</td>
<td>17(2.8)</td>
<td>25(4.1)</td>
</tr>
<tr>
<td>Incontinence</td>
<td>6(1.0)</td>
<td>13(2.1)</td>
<td>19(3.1)</td>
</tr>
<tr>
<td>Sexual dysfunction</td>
<td>5(0.8)</td>
<td>69(11.3)</td>
<td>74(12.1)</td>
</tr>
</tbody>
</table>
American Urological Association (AUA) Guideline

MALE URETHRAL STRicture: AUA GUIDELINE

Hunter Wessells, MD; Kenneth W. Angermeier, MD; Sean P. Elliott, MD; Christopher M. Gonzalez, MD; Ron T. Kodama, MD; Andrew C. Peterson, MD; James Reston, Ph.D.; Keith Rourke, MD; John T. Stoffel, MD; Alex Vanni, MD; Bryan Voelzke, MD; Lee Zhao, MD; Richard A. Santucci, MD

PURPOSE
The purpose of this guideline is to provide a clinical framework for the diagnosis and treatment of urethral stricture.

METHODS
A systematic review of the literature using the Pubmed, Embase, and Cochrane databases (search dates 1/1/1990 to 12/1/2015) was conducted to identify peer-reviewed publications relevant to the diagnosis and treatment of urethral stricture. The review yielded an evidence base of 250 articles after application of inclusion/exclusion criteria. These publications were used to create the guideline statements. If sufficient evidence existed, then the body of evidence for a particular treatment was assigned a strength rating of A (high quality evidence; high certainty), B (moderate quality evidence; moderate certainty), or C (low quality evidence; low certainty) and evidence-based statements of Strong, Moderate, or Conditional Recommendation based on risks and benefits were developed. Additional information is provided as Clinical Principles and Expert Opinions when insufficient evidence existed.

GUIDELINE STATEMENTS
AUA Guidelines

• 32 Guideline Statements
• Almost all are moderate or conditional recommendations, expert opinion, or clinical principles
• All but one is grade C (poor data quality, low level of certainty)
AUA Guidelines

- Diagnosis/Initial Management
- Dilation/Urethrotomy/Urethroplasty
- Anterior Urethral Reconstruction
- Pelvic Fracture Urethral Injury
- Bladder Neck Contracture/Vesicourethral Stenosis
- Special Circumstances
- Follow-Up
Diagnosis

Good doctor, can you help with my LUTS?

Of course, sir, but let me check the AUA Guidelines.
Diagnosis

1. Clinicians should include urethral stricture in the differential diagnosis of men who present with decreased urinary stream, incomplete emptying, dysuria, urinary tract infection (UTI), and rising post void residual. (Moderate Recommendation; Evidence Strength Grade C)

2. After performing a history, physical examination, and urinalysis, clinicians may use a combination of patient reported measures, uroflowmetry, and ultrasound post void residual assessment in the initial evaluation of suspected urethral stricture. (Clinical Principle)
Urethral Diameter

**Urethral Diameter versus AUA Symptom Index**

Fig. 1. Correlation of urethral diameter in Fr with AUA symptom index (SI). Dotted lines indicate 90% CI.

**Urethral Diameter versus Peak Urinary Flow Rate (Qmax)**

Fig. 2. Correlation of urethral diameter in Fr with peak maximum urine flow. Dotted lines indicate 90% CI.
3. Clinicians should use **urethro-cystoscopy**, retrograde urethrography, voiding cystourethrography, or ultrasound urethography to make a diagnosis of urethral stricture. (Moderate Recommendation; Evidence Strength Grade C)
BPH Guidelines

• “Urethrocystoscopy may be appropriate in men with a history of microscopic or gross hematuria, urethral stricture (or risk factors, such as history of urethritis or urethral injury), bladder cancer, or prior lower urinary tract surgery (especially transurethral resection of the prostate [TURP]). This test should not be used in the initial evaluation of patients without these risk factors...”
4. Clinicians planning non-urgent intervention for a known stricture should determine the length and location of the urethral stricture. (Expert Opinion)
RUG and VCUG

- Can show urethral caliber **proximal to the stricture** that can’t be seen endoscopically
- Accurately measures penile urethral stricture
- Often underestimates bulbar urethral stricture length
• De Grado et al, AUA 2015
• 103 patients referred, 91 treated for urethral stricture prior to referral
• 76 were treated without urethral imaging or having a discussion about urethroplasty
5. Surgeons may utilize urethral endoscopic management (e.g. urethral dilation or direct visual internal urethrotomy [DVIU]) or immediate suprapubic cystostomy for urgent management of urethral stricture, such as discovery of symptomatic urinary retention or catheterization prior to another surgical procedure. (Expert Opinion)

6. Surgeons may place a suprapubic (SP) cystostomy prior to definitive urethroplasty in patients dependent on an indwelling urethral catheter or intermittent self-dilation. (Expert Opinion)
Urethral Rest

- Urethroplasty is scar revision or replacement surgery
- Need a **stable stricture** prior to surgery
- Prefer no instrumentation 3 months prior
- Place SP tube if in retention

Morey, 2011
Uh-Oh...
Treatment

• 7. Surgeons may offer urethral dilation, direct visual internal urethrotomy (DVIU), or urethroplasty for the initial treatment of a short (< 2 cm) bulbar urethral stricture. (Conditional Recommendation; Evidence Strength Grade C)
Treatment

8. Surgeons may perform either dilation or direct visual internal urethrotomy (DVIU) when performing endoscopic treatment of a urethral stricture. (Conditional Recommendation; Evidence Strength Grade C)
Treatment Options

WHAT DO I CHOOSE?

TOO MANY OPTIONS!
INTERNAL URETHROTOMY VERSUS DILATION AS TREATMENT FOR MALE URETHRAL STRICTURES: A PROSPECTIVE, RANDOMIZED COMPARISON

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From the Department of Urology, Faculty of Medicine, University of Stellenbosch and Tygerberg Hospital, Tygerberg, South Africa

ABSTRACT

Purpose: We compared the efficacy of dilation versus internal urethrotomy as initial outpatient treatment for male urethral stricture disease.

Materials and Methods: A total of 210 men with proved urethral strictures was randomized to undergo filiform dilation (106) or optical internal urethrotomy (104) with local anesthesia on an outpatient basis.

Results: Life table survival analysis showed no significant difference between the 2 treatments with regard to stricture recurrence. Hazard function analysis showed that the risk of stricture recurrence was greatest at 6 months, whereas the risk of failure after 12 months was slight. The recurrence rate at 12 months was approximately 40% for strictures shorter than 2 cm. and 80% for those longer than 4 cm., whereas the recurrence rate for strictures 2 to 4 cm. long increased from approximately 50% at 12 months to approximately 75% at 48 months. Cox regression analysis showed that for each 1 cm. increase in length of the stricture the risk of recurrence was increased by 1.22 (95% confidence interval 1.05 to 1.43).

Conclusions: There is no significant difference in efficacy between dilation and internal urethrotomy as initial treatment for strictures. Both methods become less effective with increasing stricture length. We recommend dilation or internal urethrotomy for strictures shorter than 2 cm., primary urethroplasty for those longer than 4 cm. and a trial of dilation or urethrotomy for those 2 to 4 cm. long.
Reconstructive Ladder

Urethroplasty
DVIU
Dilation
DVIU
Dilation
Treatment Overview

• Not a “Reconstructive Ladder”
• “Its worth a try approach” is archaic
• What is the goal?
  – Management with temporizing measures?
  – Cure?
Simple urethral dilatation, endoscopic urethrotomy, and urethroplasty for urethral stricture disease in adult men (Review)

Wong SSW, Aboumarzouk OM, Narahari R, O'Riordan A, Pickard R

THE COCHRANE COLLABORATION®
OBJECTIVES

To determine, based on current evidence, which intervention for urethral stricture in adult men is best in terms of efficacy, adverse effects, and cost.

Specific comparisons to be made are as follows:
1. urethrotomy versus urethral dilatation;
2. urethrotomy versus urethroplasty;
3. urethral dilatation versus urethroplasty.

One study (already discussed)

No studies
Authors’ conclusions

There were insufficient data to determine which intervention is best for urethral stricture disease in terms of balancing efficacy, adverse effects and costs. Well designed, adequately powered multi-centre trials are needed to answer relevant clinical questions regarding treatment of men with urethral strictures.
“One point not discussed...With the slightest breach of the urethral epithelium on urethrography there is gross extravasation into the spongiosum and from there into the venous drainage of the penis. I would imagine that injecting 2 ml mitomycin probably had the same result, that is, extensive extravasation through the spongiosum and into the venous drainage...But it does suggest that the mitomycin does not remain very long in the area where it has been injected and therefore might not do much good in practice even if it might be good in theory.”

– Tony Mundy, European Urology - 2007
10. In patients who are not candidates for urethroplasty, clinicians may recommend self-catheterization after direct visual internal urethrotomy (DVIU) to maintain temporary urethral patency. (Conditional Recommendation; Evidence Strength Grade C)
Intermittent self-dilatation for urethral stricture disease in males (Review)

Jackson MJ, Veeratterapillay R, Harding CK, Dorkin TJ

QUALITY OF THE EVIDENCE

The trials in this review were generally small and poorly designed or poorly explained. All of the trials were conducted in a way which meant they had a high chance of generating an answer that does not represent the truth.
### Analysis 1.1: Comparison of ISD versus no treatment, Outcome 1: Recurrent urethral stricture.

**Review:** Intermittent self-dilatation for urethral stricture disease in males

**Comparison:** 1 ISD versus no treatment

**Outcome:** 1 Recurrent urethral stricture

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>ISD</th>
<th>No treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n/N</td>
<td>n/N</td>
</tr>
<tr>
<td>Bodker 1992</td>
<td>18/23</td>
<td>23/28</td>
</tr>
<tr>
<td>Kjaergaard 1994</td>
<td>4/21</td>
<td>15/22</td>
</tr>
<tr>
<td>Matalanis 1995</td>
<td>6/23</td>
<td>8/21</td>
</tr>
<tr>
<td>Hugmann 2006</td>
<td>27/35</td>
<td>28/37</td>
</tr>
<tr>
<td>Afifi 2010</td>
<td>26/73</td>
<td>42/73</td>
</tr>
</tbody>
</table>

**Total (95% CI):**
- **ISD:** 197
- **No treatment:** 207

**Risk Ratio:**
- **Weight:** 100.0%
- **Risk Ratio:** 0.70 (0.48, 1.00)

**Heterogeneity:** Tau² = 0.12; Chi² = 18.02; df = 5 (P = 0.003); I² = 72%

**Test for overall effect:** Z = 1.96 (P = 0.050)

**Test for subgroup differences:** Not applicable

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CIC

8-24 month follow-up
CIC - Recurrence

• Recurrence was less common in men who performed intermittent self-dilatation
  – (85/197, 43%) vs (128/207, 62%)
  – (RR 0.70, 95% CI 0.48 to 1.00, Analysis 1.1)
  – NNT = 5.4

• Significant heterogeneity
  – Failure not uniformly defined, only one study used need for further procedures
  – Follow-up length variable.

• No difference in outcome for duration of CIC, type of catheter, use of lubricant
11. Surgeons should offer urethroplasty, instead of repeated endoscopic management for recurrent anterior urethral strictures following failed dilation or direct visual internal urethrotomy (DVIU). (Moderate Recommendation; Evidence Strength Grade C)
Primary DVIU Outcomes

**TABLE III. Reported success rates for DVIU**

<table>
<thead>
<tr>
<th>Investigator</th>
<th>n</th>
<th>Follow-up (yr)</th>
<th>Success Rate for All (%)</th>
<th>Success Rate for &lt;2 cm (%)</th>
<th>Success Rate for &lt;1 cm (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albers et al.³</td>
<td>357</td>
<td>4.6</td>
<td>73</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Bonn</td>
<td>580</td>
<td>3.2</td>
<td>—</td>
<td>—</td>
<td>72</td>
</tr>
<tr>
<td>Steenkamp et al.⁴</td>
<td>104</td>
<td>4</td>
<td>39</td>
<td>60</td>
<td>—</td>
</tr>
<tr>
<td>Stormont et al.⁵</td>
<td>39</td>
<td>3</td>
<td>68</td>
<td>68</td>
<td>—</td>
</tr>
<tr>
<td>Pansadoro and Emiliozzi⁶</td>
<td>142</td>
<td>5</td>
<td>42</td>
<td>—</td>
<td>71</td>
</tr>
<tr>
<td>Heyns et al.¹⁵</td>
<td>163</td>
<td>2</td>
<td>39</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Boccon Gibod and LePortz¹⁹</td>
<td>120</td>
<td>2</td>
<td>25 (40 for bulbar)</td>
<td>—</td>
<td>85 (&lt;5 mm)</td>
</tr>
</tbody>
</table>

Key: DVIU = direct vision internal urethrotomy.
* 96% of all strictures were <2 cm.
Repeated DVIU

Santucci, 2010
NO, REALLY.
You can stop now.
Analysis of factors contributing to success or failure of 1-stage urethroplasty for urethral stricture disease.

Roehrborn CG, McConnell JD.

Abstract
We reviewed charts with adequate documentation and followup (mean 24.6 months) between 1970 and 1987 of 110 patients who had undergone 1-stage urethroplasty for urethral stricture disease at our institutions. Two age peaks were observed, 1 in the younger population (21 to 30 years old) with traumatic strictures (50% of all strictures) and 1 in elderly men (61 to 70 years old) with mainly post-inflammatory strictures (28.2% of all strictures). The majority of all strictures (63.6%) were in the bulbous urethra. Only strictures induced by trauma were located in the membranous urethra (total 28.2%). A patch graft repair was used in 49.1% of all cases, an end-to-end technique in 29.1% and a transpubic repair in 21.8%. Overall, a 57% rate of excellent results was observed with 24% failures. The results were best for patch graft repairs (65% excellent), followed by end-to-end repairs (56% excellent) and transpubic repairs (42% excellent). The choice of the surgical approach in urethral stricture surgery is dictated by the location of the stricture. The location in turn is dependent on the etiology of the stricture. Consequently, the cause of the stricture affects the location and character of the stricture and therefore, has an immediate impact on the choice of the surgical approach and, thus, the outcome of the patient. The failure rate doubled overall when the patients had a previous manipulation for the stricture disease or if the urine was infected preoperatively despite antibiotic coverage. While our patient population may not be representative for other institutions, some general conclusions regarding proper management and treatment selection can be drawn from our experience.
12. Surgeons who do not perform urethroplasty should offer patients referral to surgeons with expertise. (Expert Opinion)
Meatal Stenosis

• 13. Surgeons may initially treat meatal or fossa navicularis strictures with either dilation or meatotomy. (Clinical Principle)

• 14. Surgeons should offer urethroplasty to patients with recurrent meatal or fossa navicularis strictures. (Moderate Recommendation; Evidence Strength Grade C)
Urethroplasty

• Few Urologists have continuing experience with urethroplasty surgery
• 60% of Urologists do not perform urethroplasties
• 0.9% of Urologists perform >11 urethroplasties/yr.

15. Surgeons should offer urethroplasty to patients with **penile urethral strictures**, because of the expected high recurrence rates with endoscopic treatments. (Moderate Recommendation; Evidence Strength Grade C)

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 (DVIU) or dilation. (Moderate Recommendation; Evidence Strength Grade C)
Patient Selection

- Predictors of Urethrotomy Success:
  - Length <2cm
  - Bulbar location
  - No prior OIU/TURP
  - Limited spongiofibrosis
### Table 2. Re-stricture rates with time

<table>
<thead>
<tr>
<th>Yrs</th>
<th>% Anastomotic</th>
<th>% Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>58</td>
</tr>
</tbody>
</table>

while the results of substitution urethroplasty deteriorate steadily with time and there is definite room for improvement. An anastomotic repair should be performed in preference to a substitution repair when possible.

**KEY WORDS:** urethral stricture; anastomosis, surgical; postoperative complications
Recurrence After Urethroplasty

- Usually at proximal or distal end of buccal graft
- Responds well to dilation/OIU
  - Brandes, Peterson
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 Strength Grade C)
18. Surgeons may offer **perineal urethrostomy as a long-term treatment option** to patients as an alternative to urethroplasty. (Conditional Recommendation; Evidence Strength Grade C)

19. Surgeons should use **oral mucosa as the first choice** when using grafts for urethroplasty. (Expert Opinion)

20. Surgeons should not perform substitution urethroplasty with **allograft, xenograft, or synthetic materials** except under experimental protocols. (Expert Opinion)
• 21. Surgeons should not perform a single-stage tubularized graft urethroplasty. (Expert Opinion)

• 22. Surgeons should not use hair-bearing skin for substitution urethroplasty. (Clinical Principle)
Pelvic Fracture Urethral Injury

• 23. Clinicians should use retrograde urethrography with voiding cystourethrogram and/or retrograde + antegrade cystoscopy for preoperative planning of delayed urethroplasty after pelvic fracture urethral injury (PFUI). (Moderate Recommendation; Evidence Strength Grade C)

• 24. Surgeons should perform delayed urethroplasty instead of delayed endoscopic procedures after urethral obstruction/obliteration due to pelvic fracture urethral injury (PFUI). (Expert Opinion)

• 25. Definitive urethral reconstruction for pelvic fracture urethral injury (PFUI) should be planned only after major injuries stabilize and patients can be safely positioned for urethroplasty. (Expert Opinion)
Pelvic Hardware

• In the setting of pelvic hardware and urethral injury, it is ok to place a suprapubic tube.
26. Surgeons may perform a dilation, bladder neck incision or transurethral resection for bladder neck contracture after endoscopic prostate procedure. (Expert Opinion)

27. Surgeons may perform a dilation, vesicourethral incision, or transurethral resection for post-prostatectomy vesicourethral anastomotic stenosis. (Conditional Recommendation; Evidence Strength Grade C)

28. Surgeons may perform open reconstruction for recalcitrant stenosis of the bladder neck or post-prostatectomy vesicourethral anastomotic stenosis. (Conditional Recommendation; Evidence Strength Grade C)
“Deep” TUIBNC

- Morey, et al 2014
  - Dilate with 24Fr balloon
  - Incise to fat at 3 and 9 o’clock
  - Hemostasis
  - Cath for 5 days

- 50 patients with refractory BNC
- 72% initial success, 86% eventual success (7 with 2 procedures)
- 78% AUS
Special Circumstances

29. In men who require chronic self-catheterization (e.g. neurogenic bladder), surgeons may offer urethroplasty as a treatment option for urethral stricture causing difficulty with intermittent self-catheterization. (Expert Opinion)
Special Circumstances

30. Clinicians may perform biopsy for suspected lichen sclerosus (LS), and must perform biopsy if urethral cancer is suspected. (Clinical Principle)
31. In lichen sclerosus (LS) proven urethral stricture, surgeons should not use genital skin for reconstruction. (Strong Recommendation; Evidence Strength Grade B)
32. Clinicians should monitor urethral stricture patients to **identify symptomatic recurrence** following dilation, direct visual internal urethrotomy (DVIU) or urethroplasty. (Expert Opinion)
Follow-up

• Best method?
  – Probably the less-invasive assessments

<table>
<thead>
<tr>
<th>Method</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary flow rate</td>
<td>271</td>
<td>62.9</td>
</tr>
<tr>
<td>Cystoscopy</td>
<td>143</td>
<td>33.2</td>
</tr>
<tr>
<td>Urethral calibration</td>
<td>119</td>
<td>27.6</td>
</tr>
<tr>
<td>AUASS/IPC</td>
<td>119</td>
<td>27.6</td>
</tr>
<tr>
<td>RUG/VCUG X-ray</td>
<td>57</td>
<td>13.2</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>11</td>
<td>2.6</td>
</tr>
<tr>
<td>Other</td>
<td>21</td>
<td>4.9</td>
</tr>
</tbody>
</table>
Conclusions

• Image **prior** to treating the stricture

• Multiple dilations/urethrotomies have **low** (no?) chance of success

• CIC may reduce recurrence (for a while)

• **Discuss** or offer urethroplasty to appropriate candidates

• Patients may be **followed for recurrence** with non-invasive testing
Thank you!