LSE: Development and Validation of a Urethral Stricture Classification System

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Objective

- To develop and validate a classification system for urethral stricture disease (USD) based on retrograde urethrogram (RUG), patient history, and physical exam

Introduction

- Medical classification systems help categorize complex disease, predict outcomes, aid in communication, and facilitate research
- Male urethral stricture disease is a heterogeneous condition and differences in stricture length, location, and etiology impact treatment choice and outcomes.
- The absence of widely implemented stricture classification system impairs the ability to compare outcomes between surgeons, centers, and surgical techniques

Methods

3 variables selected: clinically useful and known to predict outcomes

L: stricture length

S: stricture segment/location

E: stricture etiology

Figure 1 and Figure 2 developed over 3 sequential validation steps

- 22 clinical vignettes detailing stricture history, physical exam, and retrograde urethrogram distributed to 20 reviewers to provide classification
- Inter-rater reliability was assessed using Light's Kappa statistical analysis
- Kappa=0.7 used as threshold of sufficient inter-rater agreement
- Reviewer feedback and analysis of vignettes with poor agreement used to revise the classification system in an iterative fashion
- Culminated with in-person Trauma and Urologic Reconstruction Network of Surgeons (TURNS) meeting, at which the final classification system was unanimously agreed upon by attendees based on interrater reliability data

Figure 1:

TURNS LSE Anterior Urethral Stricture Classification System

L – Length*	
1	≤ 2cm
2	> 2cm & ≤ 7cm
3	> 7 cm
S – Urethra Segment**	
1	**Bulbar Urethra**
1a	Bulbar Urethral Stricture without Distal Bulbar Urethra involvement.
1b	Bulbar Urethral Stricture Involving the Distal Bulbar Urethra.
2	**Penile Urethra**
2a	Stricture involving both bulbar and penile urethral segments without involvement of the fossa navicularis and/or urethral meatus.
2b	Stricture isolated to the penile urethra without fossa navicularis or meatal involvement.
2c	Stricture isolated to the penile urethra with fossa navicularis and/or meatal involvement.
2d	Stricture isolated to the fossa navicularis and/or urethral meatus.
3	Stricture involving the meatus/fossa, penile urethra and bulbar urethra (i.e. pan-urethral stricture).
S – Modifiers	
x	Portion(s) of the Stricture with Obliterated Lumen (e.g. S1ax, S2ax)
m	Separate strictures involving two or more distinct areas of the anterior urethra (managed with separate urethroplasty techniques). (e.g. Sm1a and Sm2d)
p	Extension of stricture into posterior urethra (non-PFUDD; e.g. S1ap), or isolated non-PFUDD posterior urethral stricture (e.g. Sp)
E – Etiology ***	
1	External Trauma (e.g. known straddle injury)
2	Idiopathic/Unknown Etiology
3	Iatrogenic
3a	Internal Trauma (e.g. post TURP/TURBT stricture)
3b	Recurrent Urethral Stricture in Prior Urethroplasty Segment (excluding hypospadias repairs (E5))
3c	Radiation Induced Urethral Stricture
4	Infectious/Inflammatory (e.g. post-gonococcal)
5	Stricture in Segment of Prior Hypospadias Repair
6	Lichen Sclerosus

* Total length of the diseased urethra being managed with a single urethroplasty technique. If an m modifier is utilized, two L variable values will be listed.

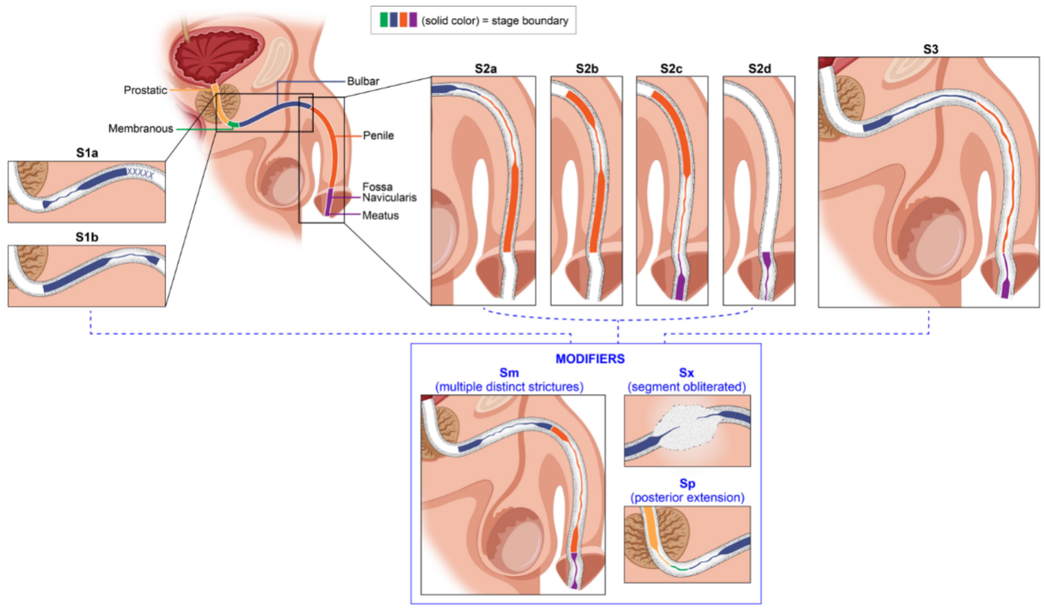
** If multiple strictures are radiographically isolated but are managed with a single technique, classify as a single stricture. If the strictures are managed separately (e.g. anastomotic repair for bulbar stricture, onlay for penile repair) then the m modifier should be utilized

*** If multiple etiologies suspected/known, stage with highest numbered etiology.

Kappa:

- 0.0–0.2: indicates none to slight agreement,
- 0.2–0.4: fair,
- 0.4– 0.6: moderate,
- 0.6–0.8: substantial
- 0.8–1.0: as almost perfect agreement

Figure 2: LSE classification segment (S) variables with modifiers



Results

- **Overall Kappa= 0.79 (substantial agreement)**
- **Individual component kappa values increased with each validation step**
  - **L:** 0.71 to 0.72 to 0.76
  - **S**: 0.50 to 0.56 to 0.70
  - **E:** 0.85 to 0.98 to 0.93

Conclusions

- The inter-rater reliability of the LSE classification system was sufficiently high to be used clinically.
- This system has also now been validated in complementary studies for its ability to predict urethroplasty type and surgical outcomes.
- Widespread use of a classification system in clinical and research endeavors will improve communication with other clinicians, with prospective patients, and will facilitate multi-institutional outcomes studies and meta-analyses.