Urethral Rest with Suprapubic Cystostomy for Obliterative or Nearly Obliterative Urethral Strictures: Urethrographic Changes and Implications for Management

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Purpose: Precise preoperative characterization of urethral stricture is important for surgical planning. A period of urethral rest by a suprapubic cystostomy tube may aid in stricture characterization and affect the surgical approach. In this study fellowship trained reconstructive urologists compared the radiographic characterization of anterior urethral strictures before and after a period of urethral rest. We then determined how this changed the planned operative approach.

Materials and Methods: We queried our prospectively maintained urethroplasty database at our institution for men with an anterior urethral stricture who underwent retrograde urethrogram and voiding cystourethrogram before and after preoperative suprapubic cystostomy tube placement. A total of 29 men were identified for analysis. To minimize responder fatigue 20 pairs of radiographs were selected at random. All images before and after suprapubic tube placement were interpreted in random order by 11 fellowship trained reconstructive urologists. Interpretation included stricture length, diameter, location and surgeon operative plan. Preplacement and post-placement results were compared. Post-placement stricture length was also compared to intraoperative length. ICC was used to evaluate homogeneity among the urologists. Linear regression analysis was performed to determine the association of post-radiographic length after tube placement with intraoperative stricture length.

Results: Imaging agreement among interpreting urologists was satisfactory (ICC 0.72). There was no statistically significant difference in stricture length before vs after suprapubic tube placement. Of the images 23% were considered obliterative before tube placement while 58% were obliterative after placement ($p = 0.0005$). Mean $\pm$ SD post-placement radiographic and intraoperative stricture length was 3.0 ± 2.6 and 3.8 ± 3.3 cm, respectively ($p < 0.0001$). Deviation between the radiographic and intraoperative lengths increased with stricture length (slope 0.26, $p = 0.0023$). The surgeon operative plan changed 47% of the time, including to an excision approach in 37% of cases.

Conclusions: Despite optimal urethral imaging with a suprapubic tube in men with high grade stricture reconstructive urologists underestimated length by an average of almost 1 cm. This underestimation was less for shorter strictures and it increased with stricture length. In addition, a period of urethral rest resulted in more frequent stricture obliteration, which was associated with a change in the planned operative approach about half of the time. If urologists do not place a

Abbreviations and Acronyms

RUG = retrograde urethrogram

SPC = suprapubic cystostomy

VCUG = voiding cystourethrogram

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suprapubic cystostomy tube prior to urethroplasty for high grade stricture, the operative plan should account for the stricture being tighter than it may appear.

Key Words: urethral stricture; diagnostic imaging; cystostomy; reconstructive surgical procedures; diagnostic techniques, surgical

THE combination of RUG and VCUG is the gold standard for evaluating anterior urethral strictures.[1] Accurate imaging is important for surgical decision making when stricture length, location and caliber dictate the operative approach.[2] Surgeons may elect to place a SPC prior to urethroplasty in men with tight/obliterative strictures or men on urethral self-dilation. In the former group SPC facilitates VCUG when one cannot place a catheter across the stricture to fill the bladder.

VCUG is an important adjunct to RUG because without it one may not be able to see the proximal extent of disease, particularly in obliterative stricture cases. SPC may also enable a stricture to mature prior to repair. In the obliterative stricture group the SPC gives the urethra some rest from high pressure voiding, which may then enable inflammation to subside preoperatively. In the self-dilation group the SPC allows for the self-dilation, which is important to accurately assess preoperative stricture length and minimize inflammation preoperatively.

We preoperatively place a SPC in a small minority of our patients prior to urethroplasty. Because SPCs likely add to patient discomfort, delay progression to surgery and increase cost, we reserve them for the 2 situations described. To better characterize the role of SPCs in this scenario we pursued 2 aims. 1) We assessed the imaging characteristics of anterior urethral strictures and the planned surgical approach before vs after a period of urethral rest with a SPC. 2) We compared post-SPC RUG/VCUG findings with intraoperative stricture length.

We hypothesized that anterior urethral strictures tend to become obliterated after a period of urethral rest. This in turn changes the surgeon operative plan toward an excision rather than an augmentation approach. We further hypothesized that although urethral rest with a SPC may lead to stricture lengthening, the degree of lengthening would be minimal and, thus, not be reflected by an increased number of augmentation approaches. Additionally, we hypothesized that despite subspecialty training and optimal imaging with a period of urethral rest underestimating stricture length would persist.

MATERIALS AND METHODS

We queried an institutional review board approved, prospectively maintained database at our institution and identified patients between 2010 and 2015 with anterior urethral stricture who underwent SPC placement prior to urethroplasty. RUG/VCUG were performed before and 4 weeks or more after SPC placement. Reasons for a SPC included 1) an obliterated urethral stricture or difficult catheterization across the stricture, resulting in inadequate VCUG, 2) patient dependence on self-dilation or an indwelling urethral catheter, or 3) impending urinary retention or severe obstructive voiding symptoms. Patients with a pelvic fracture urethral injury or posterior urethral stenosis from prostate cancer treatment were excluded from analysis. In the 29 patients who met study inclusion criteria a total of 20 pairs of radiographs were selected at random to minimize responder fatigue.

All 20 image sets were interpreted by 11 fellowship trained reconstructive urologists. No measurement tool was superimposed on the images. The urologists were blinded to patient demographics and stricture etiology. Post-SPC images were edited so that no evidence of the catheter was present. Images were randomly ordered so that preSPC and post-SPC images were dissociated from each other.

Images and a questionnaire were distributed to the urologists online using REDCap (https://www.projectredcap.org/). Each urologist was asked to evaluate the length, anatomical location(s) and diameter of the narrowest area of the stricture as well as the operative approach. Figure 1 shows the questionnaire that each urologist received. When surgeons marked that no stricture was noted or there was inadequate imaging to fully evaluate the stricture, these imaging sets of that surgeon were excluded from analysis.

Intraoperative stricture length was assessed by a single reconstructive urologist during urethroplasty by measurement of the excised scar during excision and primary anastomosis procedures or by inspection after urethrotomy in patients who underwent an augmentation procedure.

Mean stricture length, the frequency of urethral lumen obliteration (less than 5Fr), stricture location and the planned surgical approach were compared before vs after SPC insertion by the 2-sided Student t-test, the Fisher exact test or the chi-square test as appropriate. The surgical approach was categorized as augmentation (including grafts or flaps without urethral transection), excision (excision and primary anastomosis or augmented anastomotic urethroplasty), staged or other.

Interrater reliability of post-SPC stricture length measurement among the reconstructive urologists was assessed with the ICC. ICC scores range from 0 to 1 with 1 representing perfect concordance. Values are considered poor at less than 0.4, fair between 0.4 and 0.59, good between 0.6 and 0.74, and excellent at greater than 0.75.[3]