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Acquired Male Urethral Diverticula: Presentation, Diagnosis and Management

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Abbreviations and Acronyms

CIC = clean intermittent catheterization

UD = urethral diverticulum

UTI = urinary tract infection

VCUG = voiding cystourethrography

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Study received university review board approval.

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Purpose: We describe the etiology, presentation, treatment and outcomes of men diagnosed with an acquired urethral diverticulum.

Materials and Methods: We retrospectively analyzed the records of men with an acquired urethral diverticulum in an 11-year period (2000 to 2011) at a tertiary care reconstructive practice. Patient demographics, history, presentation, anatomical details such as diverticulum size and location, management and outcomes were recorded. Technical success was defined as unobstructed urination without urinary tract infection.

Results: A total of 22 men with an acquired urethral diverticulum were included in analysis. Median age at presentation was 48.5 years (range 18 to 86). Most commonly, patients presented with recurrent urinary tract infection, urinary dribbling, incontinence or a weak urinary stream. Of the 22 men 12 (54.5%) underwent urethral diverticulectomy and urethroplasty, 3 (13.5%) underwent ileal conduit urinary diversion and 7 (32%) were treated nonoperatively. Select cases were managed conservatively when the urethral diverticulum was confirmed in a nonobstructed urethra, it was small or asymptomatic and it could be manually emptied after voiding. At a mean followup of 2.3 years there was a 91% urethral diverticulum recurrence-free rate.

Conclusions: Acquired male urethral diverticula are rare but should be considered when there is recurrent urinary tract infection, obstructive voiding symptoms, a history of hypospadias, urethral stricture or trauma, or prolonged urethral catheterization. Treatment options may include surgical excision of the urethral diverticulum or urinary diversion. Some patients may be adequately treated nonoperatively with post-void manual decompression.

Key Words: urethra, diverticulum, etiology, male, reconstructive surgical procedures

A UD is a saccular dilatation extending from and contiguous with the true urethral lumen. The communication between the UD and the true urethral lumen may have a narrow or a wide neck. Consequences of a UD in a male are often related to inadequate UD drainage, the UD as a nidus for urinary stasis, recurrent UTIs, stone formation, increasing UD size, urinary

leakage, incontinence or a palpable penoscrotal mass.¹ While UD's are more common in women secondary to poor anatomical support of the urethra, it is a rare finding in men.² The literature related to male UD involves case reports or small patient series. To our knowledge there is no estimated prevalence of male UD in the literature.

While 67% to 90% of UD are acquired, up to a third may be congenital.³ Congenital UD are lined by epithelium with full-thickness involvement of the urethral wall. In contrast, acquired UD are lined by epithelium and granulation tissue, and the UD wall lacks smooth muscle fibers.⁴

Acquired UD often result from stricture, infection or trauma.⁵ Surgical implants can erode into the urethral lumen, resulting in obstruction and infection, and potentially leading to a UD. A UD can also result from an indwelling urethral catheter⁶ or previous surgery. UD can develop after surgical treatment of hypospadias or urethral stricture, artificial urinary sphincter insertion and transurethral prostate or bladder procedures.

We present our experience with male UD. Although it is a rare entity, we seek to heighten clinical suspicion of a UD in men who have had recurrent UTIs or obstructive voiding symptoms, or underwent prior urethral injury or surgery.

MATERIALS AND METHODS

A total of 22 men with an acquired UD were evaluated at a reconstructive practice at our institution from 2000 through 2011. University institutional review board approval was obtained before retrospectively reviewing the charts of male patients diagnosed with a UD. Analyzed variables included age at diagnosis, medical, surgical and urological history, presenting symptoms, voiding status, UD etiology and characteristics, diagnostic procedure and surgical notes, complications and followup.

Patients were initially evaluated with history and physical examination, followed by radiographic studies, including retrograde urethrography and VCUG (part A of sole figure). Some patients were also evaluated with cystourethroscopy and/or urodynamics. Patients brought to the operating room for urethral diverticulectomy underwent urethral ultrasonography intraoperatively to help determine the surgical approach (part B of sole figure). This included the identification of UD location, volume and neck size.

Success for patients following a regimen of post-void manual decompression was defined by absent UTI and

Presenting symptoms and UD etiology in 22 patients

	No. Pts (%)
<i>Symptom*</i>	
Post-void dribbling/urinary incontinence	8 (36)
Recurrent UTI	7 (32)
Weak stream	6 (27)
Penoscrotal mass	5 (23)
Incomplete emptying	3 (14)
Urethral stricture	3 (14)
Urethrocuteaneous fistula	2 (9)
Urethral calculus	1 (4)
<i>Etiology*</i>	
Previous urological surgery	19 (86)
Urethral stricture:	8 (36)
Urethroplasty	5 (23)
Direct vision internal urethrotomy for stricture disease	3 (14)
Hypospadias repair	6 (27)
Hypospadias repair + subsequent urethrocuteaneous fistula repair	2 (9)
Surgical implant associated urethral erosion:	4 (18)
Artificial urinary sphincter placement	3 (14)
Neourethral + testicular prostheses	1 (4)
Prostate/bladder tumor transurethral resection	3 (14)
Blunt urethral trauma	3 (14)
Prostate radiation	2 (9)
Prolonged catheterization	1 (4)

* Patients may have had more than 1 symptom or etiology.

urinary symptoms. Success for patients treated with urethral diverticulectomy was defined as unobstructed urination without UD recurrence or UTI.

RESULTS

Clinical Presentation and Diagnosis

Our study included 22 patients with a median age of 48.5 years (range 18 to 86) at presentation who had an acquired male UD. Presentation included urinary dribbling or incontinence in 8 of 22 patients (36%), recurrent UTIs in 7 (32%), a weak stream in 6 (27%) and a penoscrotal mass in 5 (23%). Other clinical indications that led to the diagnosis of a UD included urinary retention, urethral stricture, urethrocuteaneous fistula and inability to catheterize (see table).

Preoperative, intraoperative and postoperative imaging of 1 patient with distal bulbar UD. A, preoperative VCUG. B, intraoperative urethral ultrasound using 7.5 MHz probe before UD excision and primary anastomosis. C, postoperative VCUG reveals absence of UD without urethral stenosis or extravasation.

While physical examination demonstrated a palpable penoscrotal mass in 23% of this cohort, 80% were diagnosed based on history with confirmatory imaging. UD was diagnosed in the bulbar urethra in 12 patients (55%), the pendulous urethra in 9 (41%) and the membranous urethra in 1 (4%). Most UDs originated ventrally. Only 1 UD was noted to be dorsal.

A total of 19 patients (86%) had a history of urological procedures, 11 (50%) had a history of urethral stricture disease or blunt urethral trauma and 6 (27%) previously underwent hypospadias repair. Four patients (18%) were identified with a UD in the face of urethral erosion from a surgical implant (see table). Urethral erosion developed after artificial urinary sphincter placement in 3 of 4 patients and after testicular prosthesis placement in 1. This patient underwent female-to-male gender reassignment surgery elsewhere, which included neourethra construction from labial mucosa and concomitant bilateral testicular prosthesis placement. The patient subsequently presented with obstructive voiding symptoms and cystoscopy revealed a UD incorporating the left testicular prosthesis.

Two patients (9%) were treated with prior endoscopic incision of the UD with a second concomitant transurethral procedure before presenting to our clinic. One patient underwent direct vision internal urethrotomy for a urethral stricture. During evaluation at our clinic, he was noted to have a UD without evidence of urethral stricture. Retained contrast material in the UD was successfully emptied by post-void manual decompression of the UD, as confirmed by radiographic imaging. Thereafter this patient continued successful management with manual compression. The other patient underwent transurethral resection of a bladder tumor and presented with recurrent UTIs. Since manual compression did not adequately empty the UD, he was treated with urethral diverticulectomy and primary urethral anastomosis.

Management

Patients were treated in 1 of 3 ways, including nonoperatively, or with urethral diverticulectomy and reconstruction or urinary diversion.

Nonoperative management. Patients who presented with a UD and a penoscrotal mass that could be successfully emptied with manual compression were treated nonoperatively. Patients with a UD and recurrent UTIs in the absence of urethral obstruction, who subsequently responded to prophylactic antibiotics without UTI recurrence, were selectively treated nonoperatively.

Urethral diverticulectomy and reconstruction. Indications for urethroplasty included recurrent UTIs

despite antibiotic therapy, obstructive voiding or a stone in the UD. One patient was identified with calculi in the UD.

For UD of the bulbar urethra less than 3.0 cm, UD excision with end-to-end urethral anastomosis was performed. Six patients (50%) underwent UD excision and primary end-to-end urethral anastomosis, of whom 1 was identified with calculi in the UD. Six patients (50%) were treated with UD excision using local urethral flaps to close the urethral defect. UDs associated with larger urethral defects or located in the pendulous urethra were reconstructed with urethral flaps, which were fashioned from the UD wall and integrated as part of urethral repair. No patient required distant grafts, such as buccal mucosa, to close the urethral defect. We strove to produce a tension-free anastomosis, multilayer closure and nonoverlapping suture lines.

Five patients (23%) were treated with previous substitution urethroplasty elsewhere for stricture disease or rupture. They underwent initial surgery with penile flaps or grafts to treat long defects in the urethra, typically greater than 5 cm. Later they presented with a UD. All patients who presented to us after prior substitution urethroplasty were successfully treated with urethral diverticulectomy.

Cases were typically managed by prophylactic oral antibiotics postoperatively until 2 weeks after catheter removal. Urethrography was performed at catheter removal (part C of sole figure).

Urinary diversion. In this study 3 patients (13.5%) underwent urinary diversion with ileal conduit creation. Two patients had paraplegia with a neurogenic bladder, urinary retention and a UD greater than 6 cm in diameter. The benefit of urinary diversion is that it provides treatment for each source of urinary stasis and potential infection, that is the UD and the neurogenic bladder. Urinary diversion also avoids the need for CIC. Local urethral surgery for the UD would still require CIC, thereby compromising urethral healing, risking urethral injury and creation of a false passage, and increasing the risk of UD recurrence.⁷ This substantiates the decision to perform suprapubic urinary diversion in patients requiring CIC for neurogenic bladder drainage with a concomitant symptomatic UD.

The third patient had a history of prostate cancer treated with external beam radiation. Subsequently severe urinary incontinence developed, which was treated with an artificial urinary sphincter. This was later removed following urethral erosion and multiple UTIs. Evaluation for recurrent UTIs revealed a large UD. The patient was treated with urinary diversion because of significant tissue fibrosis from radiation and multiple previous urethral surgeries as well as infection. Suprapubic urinary

diversion treated incontinence, restored dryness and diverted urine away from the site of infection. It also avoided reconstruction in a previously operated, irradiated area associated with poor wound healing.

UD location did not dictate management, although it was associated with treatment trends. Five of 7 patients (71%) treated nonoperatively had a UD in the penile urethra. All were successfully emptied by manual compression. In contrast, 7 of 11 patients (63.6%) who had a UD originating at the bulbar urethra were treated with excision and urethroplasty.

Outcome

Patients were followed a median of 2.3 years (range 2 months to 11 years). Of the patients 91% were UD recurrence-free at followup. Complications developed in 2 of the 22 patients (9%). Epididymo-orchitis developed following catheter removal in 1 patient who underwent urethral diverticulectomy with primary end-to-end urethral anastomosis. There was UD recurrence in 1 of 11 patients (9%) treated with urethral diverticulectomy. This patient had a complicated urological history dating back to infancy with surgical repair of hypospadias, an imperforate anus and a rectourethral fistula. He was diagnosed with a UD of the pendulous urethra. During our initial evaluation for chronic urinary incontinence, a 10 cm UD with a 4 cm communication with the anterior urethra was identified. The UD was excised and the urethral defect was reconstructed by tubularization of the anterior urethral wall. Approximately 1.5 years later, the patient was identified with radiographic recurrence of the UD, noted as approximately 20% of the original UD size. Postoperatively the patient continued to manage incontinence by a penile clamp, which may have increased urethral pressure and contributed to UD recurrence. The patient has remained asymptomatic for 2.3 years following the UD by manual compression of the recurrent UD.

DISCUSSION

It is well recognized that certain conditions such as urethral stricture, blunt trauma and infection are associated with UD development. As evidenced by our experience, there is a significant iatrogenic association.

Three suspected mechanisms exist for acquired male UDs. One mechanism is related to obstruction and increased urethral pressure with subsequent herniation of the urethral epithelium. This tends to occur in patients with a complex urological history often involving previous reconstructive procedures for hypospadias, urethral stricture and trauma or incontinence.⁸ The second mechanism is a result of

constant pressure distributed on the penoscrotal angle, which causes chronic urethral ischemia and induces urethral fibrosis and scar formation. This sometimes applies to male patients with an indwelling urethral catheter.⁷ The third mechanism incorporates anorectal malformation repair with UD occurring in 12% to 18% of cases.^{9,10} A UD develops from a retained portion of the urethral fistula and balloons out as more urine is sequestered in the herniated structure. It is suggested that a posterior sagittal surgical approach for the repair of anorectal malformation may lead to a decrease in the UD rate.

It is well accepted that the gold standard for evaluating a UD in a female involves magnetic resonance imaging.¹¹ While there are reports of magnetic resonance imaging used to evaluate male urethral diverticula,¹² fluoroscopic modalities in conjunction with urethral ultrasonography provide excellent details of the UD. These studies demonstrate UD location, volume, neck size and other urethral pathology. Patients with urological hardware should be evaluated with cystoscopy to rule out urethral obstruction and erosion.

While many patients who present with symptoms related to the UD require surgical correction, UD treatment should be individually based. Consideration should be given to the size and thickness of the UD wall, integrity of the corpus spongiosum, concomitant urethral pathology and symptoms. As evidenced by our experience, a small asymptomatic UD can be managed nonoperatively with post-void manual compression of the diverticulum to eliminate urinary stasis.¹³ In this study 7 patients were successfully treated in a conservative manner and avoided surgery for the UD at a mean of 3.2 years of followup. Patients treated nonoperatively may require prophylactic antibiotic consumption to keep the urine sterile. They also warrant close followup with the possibility of surgery at a later date should the condition progress.

We believe that endoscopic management of a UD is not curative and has a likelihood of failure with a need for reoperation. While it may be a technically easier option, there is an association with UD recurrence and risk of urethrocutaneous fistula.⁷ Endoscopic UD unroofing is also inadvisable when the surrounding supportive tissue is deficient, when a large poorly draining cavity is likely to remain or when the UD is too thick for adequate incision.¹⁴ Since many patients with an acquired UD underwent prior urethral surgery with the risk of compromised surrounding tissue support, integrity and scarring, patients in this series who were considered surgical candidates were treated with more definitive operations with UD excision and urethral reconstruction.

If nonoperative treatment is not appropriate, an open procedure must be considered. The goal of urethral diverticulectomy surgery is to excise the UD, restore urethral continuity and provide additional tissue to reinforce the repair to minimize the development of a urethrocutaneous fistula. The simplest surgical option to achieve these goals should be selected.

While local urethral and penile flaps were used in this cohort without any buccal mucosal grafts, extragenital grafts can be used, especially for larger defects of the urethral lumen.^{15,16} If the urethral defect is large, extragenital grafts can be placed ventral to avoid fistula formation and relapses derived from simple closure techniques.¹⁷ Grafts obtained from hair bearing skin should be avoided.

Urinary diversion can be a suitable option for patients with neurogenic bladder, especially those who may need frequent urethral catheterization for bladder drainage. For patients in whom urethral reconstruction is expected to be nonreconstructable (those with multiple surgeries, anatomical abnormalities or extensive fibrosis from prostatic or pelvic radiation), urinary diversion remains an option.

Strengths of this study include the relatively large size of the cohort and the spectrum of management options. Not all male patients who present with a UD need surgical treatment. However, in

some patients urinary diversion may be the most efficient definitive treatment option, although with its own inherent risks.

Patient followup may be limited, secondary to patients being referred back to care by local urologists. Since many patients lived a significant distance away and were referred to our tertiary care center, after the patient was considered clinically stable the choice was given to resume care with a local urologist. This resulted in a shorter followup. However, there is a significant likelihood that if symptoms were to recur in these patients, they would return to our center for additional care.

CONCLUSIONS

While an acquired UD in the male is a rare finding, a high index of suspicion is required for proper diagnosis and treatment. The treatment armamentarium includes nonoperative and surgical options. Patients without urethral obstruction who can manually decompress the UD without subsequent UTI can successfully undergo conservative treatment with close followup. Surgical intervention is appropriate for symptomatic or larger UDs and those with significant urinary stasis, infection or urethral calculi. Select patients may benefit from urinary diversion rather than urethral diverticulectomy and reconstruction.

REFERENCES

- De Filippo RE, Kurzrock EA, Stein JP et al: A giant urethral diverticulum presenting as a scrotal mass in an adult male. *BJU Int* 1999; **83**: 522.
- Mohan V, Gupta SK, Cherian J et al: Urethral diverticulum in male subjects: report of 5 cases. *J Urol* 1980; **123**: 592.
- Mayra SK, Kumar S and Singh S: Acquired male urethral diverticulum. *J Urol* 1977; **118**: 765.
- Wickman ME and Engel RME: Case of anterior urethral diverticulum in male quadriplegic. *J Urol* 1976; **116**: 118.
- Ho C, Yu H and Huang K: Scrotal mass with bladder outlet obstruction. *Urology* 2008; **72**: 66.
- Stephan-Carlier A, Facione J, Gervaise A et al: A 24 year old patient with paraplegia and acquired urethral diverticulum: a case report. *Ann Phys Rehabil Med* 2011; **54**: 48.
- Ortlip SA, Gonzalez R and Williams RD: Diverticula of the male urethra. *J Urol* 1980; **124**: 330.
- Allen D, Mishra V, Pepper W et al: A single-center experience of symptomatic male urethral diverticula. *Urology* 2007; **70**: 650.
- Alam S, Lawal TA, Peña A et al: Acquired posterior urethral diverticulum following surgery for anorectal malformation. *J Pediatr Surg* 2011; **46**: 1231.
- Hong AR, Acuña MF, Peña A et al: Urologic injuries associated with repair of anorectal malformations in male patients. *J Pediatr Surg* 2002; **37**: 339.
- Ockrim JL, Allen DJ, Shah PJ et al: A tertiary experience of urethral diverticulectomy: diagnosis, imaging and surgical outcomes. *BJU Int* 2009; **103**: 1550.
- Rimon U, Hertz M and Jonas P: Diverticula of the male urethra: a review of 61 cases. *Urol Radiol* 1992; **14**: 49.
- Monish A, Rajeev TP, Dorairajan LN et al: Infected congenital urethral diverticulum in an adult male. *Urol Int* 1999; **62**: 177.
- Labanaris AP, Zuger V and Witt JH: Urethral diverticulum with massive urolithiasis presenting as a scrotal mass. *Urol Int* 2011; **87**: 481.
- Alphs HH, Meeks JJ, Casey JT et al: Surgical reconstruction of the male urethral diverticulum. *Urology* 2010; **76**: 471.
- Jang TL, Blunt LW, Yap RL et al: Large urethral diverticulum presenting as a scrotal mass: urethral reconstruction with ventral onlay buccal mucosa. *J Urol* 2004; **171**: 351.
- Karanth KS, Yeluri SV, Desai RM et al: Congenital anterior urethral diverticulum with stone: a unique presentation. *Urology* 2003; **61**: 837.