

Female Urethral Diverticula*

Learning Objective: At the conclusion of this continuing medical education activity, the participant will be able to discuss the diagnosis and surgical treatment of female urethral diverticula. The participant will also be able to discuss the postoperative management and potential complications after diverticulectomy.

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Disclosures: Nothing to disclose

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***This AUA Update addresses the Core Curriculum topic of Female Pelvic Medicine & Reconstructive Surgery, and the American Board of Urology Module on Neurogenic Bladder, Voiding Dysfunction, Female Urology, BPH and Urethral Stricture.**

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INTRODUCTION

Urethral diverticula are rare and can occur at any age in either gender but most commonly affect adult females. Although a classic triad of symptoms has been historically described, most symptomatic females present with a myriad of vague symptoms resulting in delayed diagnosis.¹ Diagnosis and evaluation of UD is often aided by imaging, which has improved in quality over time. Definitive treatment of UD involves surgical excision, reconstruction and occasionally concomitant pelvic or vaginal surgery.

ETIOLOGY AND INCIDENCE

A urethral diverticulum is a periurethral cystic structure that is connected to the urethra via an ostium. **UD are most often located along the posterior urethral wall of the mid to distal urethra.**²⁻⁴ For this reason they are thought to arise from repeated infection and obstruction of periurethral glands that typically occupy the same region.^{2,5} Another possible etiology may be periurethral trauma such as prior surgery, urethral dilations or traumatic delivery.⁶⁻⁸ High tone non-relaxing sphincter with subsequent increased intraluminal urethral pressure during voiding has recently been suggested as another contributing factor to the development of UD.⁹

Female UD are rare, affecting fewer than 20 in 1,000,000 women per year and occurring in <1% to 6% of women.^{3,7,10} **Female UD are typically found in patients 30–60 years old and are reported to have a higher prevalence in African American women.**^{1,2,11,12} **UD are found in 1.4% of women who present with complaints of stress urinary incontinence and represent 84% of adult female periurethral masses.**^{1,4,7,10,13-15} The majority of UD are benign; however, approximately 3%–9% of cases are associated with malignant changes.^{3,11,12,16,17}

CLINICAL PRESENTATION OF URETHRAL DIVERTICULA

The clinical presentation of UD has historically been described as a classic symptom triad of dysuria, post-void dribbling and dyspareunia.^{4,11,13} **While these symptoms may be present, studies have indicated that this triad occurs in only 5%–23% of patients, and up to 27% of patients with UD may be totally asymptomatic.**^{4,10,11,13,18} Of symptomatic patients 18%–60% report dysuria, 5%–32% note dribbling and 12%–60% report dyspareunia.^{3,4,10,11,13,18,19} Female UD often present with a variety of vague symptoms that overlap with other differential diagnoses. Other common presenting signs and symptoms of UD include urinary incontinence (10%–60%), vaginal/periurethral mass (52%–90%), urinary urgency and/or frequency (10%–60%), recurrent urinary tract infections (7%–70%), and vaginal and/or urethral pain (7%–48%).^{3,11-13,18,19} Additionally female UD may present with urethral discharge (13%–21%), gross hematuria (0%–9%) and urine retention (3%–7%).^{3,11-}

^{13,18} Due to the variety of presenting signs and symptoms, the diagnosis of UD may take years.^{1,11,18}

EVALUATION OF URETHRAL DIVERTICULA

Since female UD often present with vague and varied signs and symptoms, a high index of suspicion should be maintained when evaluating women for whom no alternative diagnosis can be found.^{1,2,11} **A detailed history should be obtained to evaluate for prior obstetric or pelvic trauma and previous vaginal or lower urinary tract surgeries. Notably periurethral bulking used for the management of SUI can mimic a urethral diverticulum on imaging and physical examination (fig. 1).**

On physical examination a proximal anterior vaginal wall bulge is present in up to 90% of patients and may be mistaken for a cystocele.^{2,11,20,21} **Palpating or “milking” this bulge may result in fluid expression from the urethral meatus in about 10%–40% of patients and is a pathognomonic finding.**^{10,11,20} The bulge may be tender on palpation and may be hard if associated with a stone or malignancy.^{10,19,20,22} **Urinary incontinence is found in up to 60% of women with UD and may be due to concomitant stress, urge or mixed incontinence, or to intermittent drainage of the UD, also called paradoxical incontinence.**^{11,23-25}

In addition to physical examination, assessment of UD should involve a urinalysis, urine culture and imaging. As previously mentioned, up to 70% of patients with UD also have recurrent UTIs, and therefore obtaining a urine sample is necessary for perioperative antibiotic selection.^{1,10,11}

Imaging of urethral diverticula. There are multiple imaging modalities that are useful in the diagnosis and characterization of female UD, including ultrasound, voiding cystourethrogram, positive pressure/double-balloon urethrography, magnetic resonance imaging and computerized tomography.²⁶

Traditionally VCUGs have been the initial diagnostic examination of choice to detect UD and accurately diagnose the condition in 67%–95% of cases.^{1,20,27,28} The test involves catheterization of the urethra with subsequent retrograde instillation of contrast fluid. Fluoroscopic images are taken during filling and voiding in order to define bladder and urethral anatomy. Although VCUG can still be used, it has fallen out of favor as the gold standard due to patient discomfort and radiation exposure, as well as the inability to locate or fully define UD with a non-patent ostium or multiple loculations.^{1,10,20,28}

Double-balloon urethrography, also called positive pressure urethrography, is performed using a specially designed double-balloon catheter that functions to make the urethra a closed tube by occluding the bladder neck and urethral meatus. Contrast material is infused into the urethra under moderate pressure, and fluoroscopic images are taken of the contrast filled urethra and UD. The 2 specialty Foley catheters that are mainly used are the Davis catheter and the Trattner catheter, with the former being preferred by some due to its adjustability.^{20,27,28} Although double-balloon urethrography is a more sensitive test than VCUG and provides more detailed images, it is not used often due to technical difficulty performing the test, patient discomfort and radiation exposure.^{1,20,27,28}

MRI is considered the gold standard for the diagnosis of

ABBREVIATIONS: MRI (magnetic resonance imaging), SUI (stress urinary incontinence), UD (urethral diverticula), US (ultrasound), UTI (urinary tract infection), VCUG (voiding cystourethrogram)

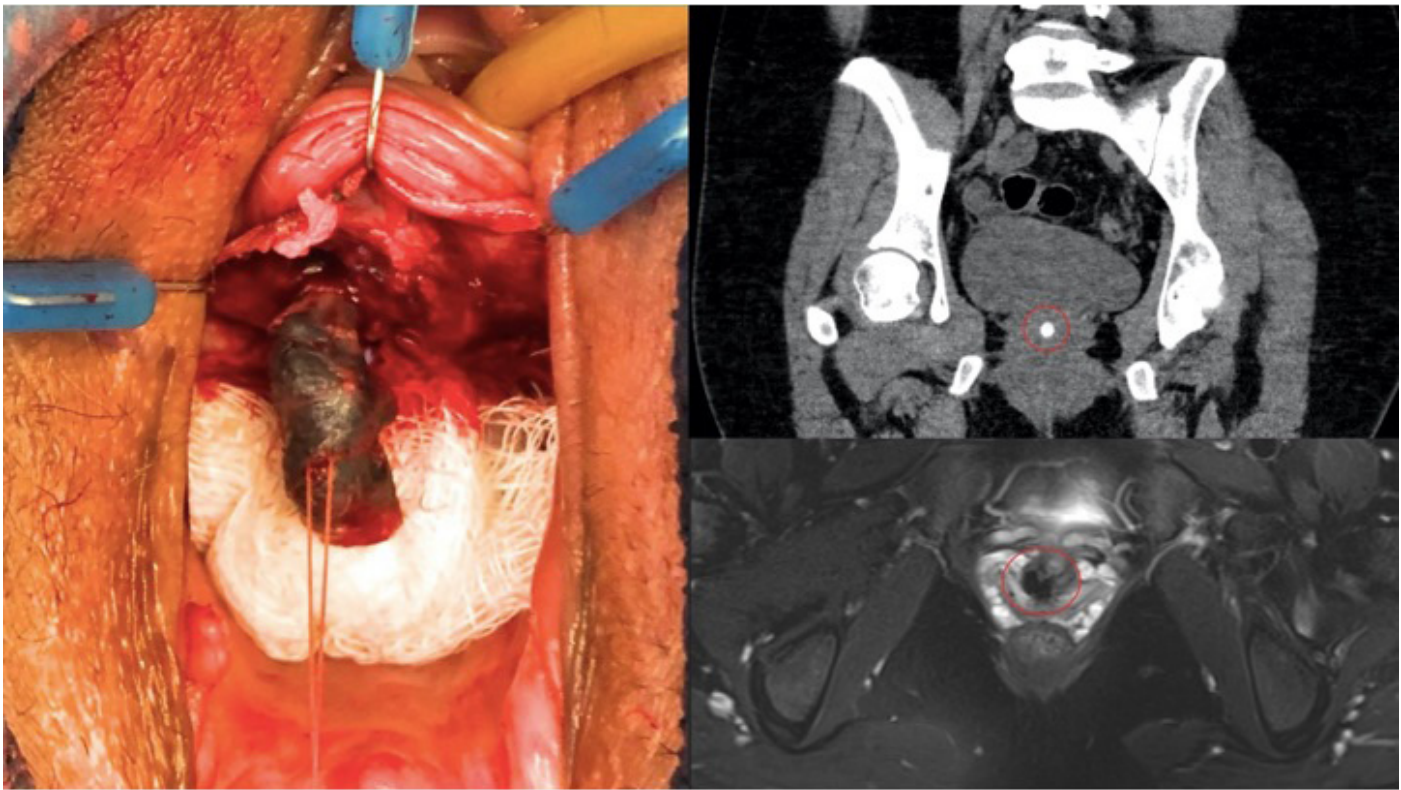


Figure 1. Periurethral lesion read on computerized tomography and MRI as possible calculus containing urethral diverticulum. On MRI calculi appear dark (low signal intensity) on T2-weighted images. Intraoperative findings confirmed lesion to be pyrolytic carbon periurethral bulking agent.

UD due to its high quality soft tissue and anatomical imaging as well as detailed views.^{1, 3, 10, 20, 28–30} **T2-weighted sequences of an MRI provide the best images with hyperintense fluid seen within the UD, although it can be seen in both sequences with or without intravenous contrast material.** The use of an endoluminal coil results in a target-like appearance of the UD on T2-weighted images and gadolinium enhanced T1-weighted images. However, smaller UD may become compressed by the coil, resulting in a false-negative study. Additionally the endoluminal coil is not readily available and thus is not essential in the diagnosis of UD by MRI. While MRI is more sensitive than urethrography and cystourethroscopy in detecting UD, with some groups reporting up to 100% sensitivity, MRI has been found to inaccurately characterize and miss UD in some cases (figs. 2 and 3).^{1, 10, 20, 28–34}

Ultrasound is another imaging modality that can be used to diagnose UD. It can be done via multiple approaches, including transabdominal, translabial/transperineal and transluminal (transvaginal, transrectal, transurethral). Although ultrasound is cost-effective and radiation-free, it is not the preferred method of imaging for diagnosis due to technical difficulty of performing, low sensitivity in UD detection and difficulty distinguishing UD from other periurethral lesions.^{20, 28, 35} Transabdominal US can be done in patients with a distended bladder but is relatively insensitive for detecting smaller UD compared to other imaging modalities.²⁸ Translabial US has been found to be more sensitive than transabdominal US in detecting UD but it also does not detect smaller UD well.^{20, 28, 36} Transluminal US yields the most accurate and diagnostic information of the various US routes, with transvaginal US being the most commonly used to diagnose UD.^{28, 37, 38} Transvaginal US is preferred by

many practitioners due to its low cost, widespread US availability, lack of exposure to ionized radiation and accuracy in detecting UD. However, the UD may be compressed during the imaging process, and it may be difficult to find technicians competent at performing the US, which is an invasive test.^{20, 28, 35, 37, 39, 40} Endourethral US has been found to have excellent sensitivity for even smaller UD. However, due to the high cost and associated discomfort during imaging, it is generally used intraoperatively if needed.^{15, 28, 37}

Computerized tomography scan with intravenous contrast has limited ability to adequately characterize smaller UD, although it may have utility in identifying indwelling UD calculi or enhancing lesions.^{20, 28} While advances in 3-dimensional and 4-dimensional image processing have increased the sensitivity of computerized tomography in the diagnosis of UD, this image processing may not be widely available, and the modality has the disadvantage of exposure to ionizing radiation.^{20, 28, 41}

Cystourethroscopy and urodynamics for evaluation of urethral diverticula. Cystourethroscopy, which is usually done at the time of surgical repair, can also be used to diagnose and evaluate UD preoperatively. Using continuous irrigation to distend the urethra, either a flexible cystoscope or a rigid cystoscope with a short beak and lens of 30 degrees or less can be used to examine the urethra in order to identify the UD ostia. **The majority of UD are located along the posterolateral distal two-thirds of the urethra and compression of the UD from the vaginal side during urethroscopy may aid in locating the ostium.** As some UD present with associated tenderness, preoperative cystourethroscopy may cause significant additional patient discomfort. Furthermore, not all UD ostia are patent at the time of presentation, and a 2016 meta-analysis found that visu-

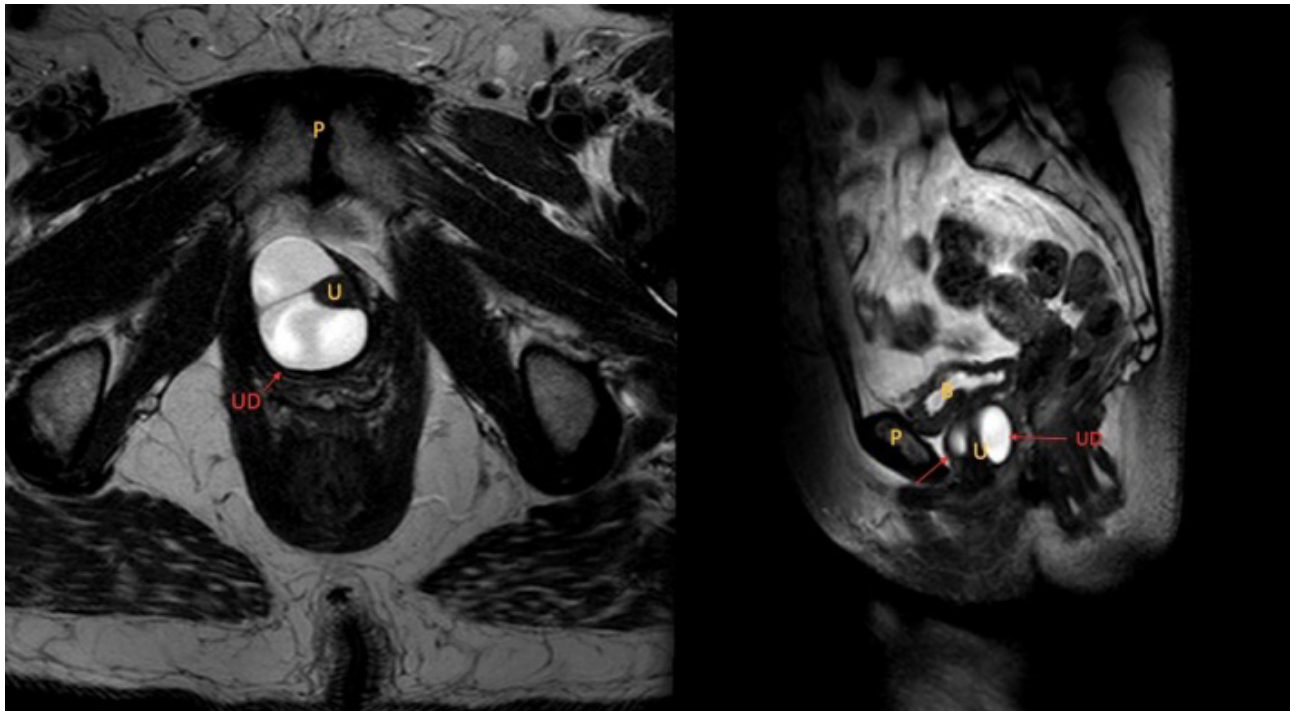


Figure 2. Urethral diverticulum with septation on T2-weighted contrast enhanced MRI. *U*, urethra. *B*, bladder. *P*, pubic bone.

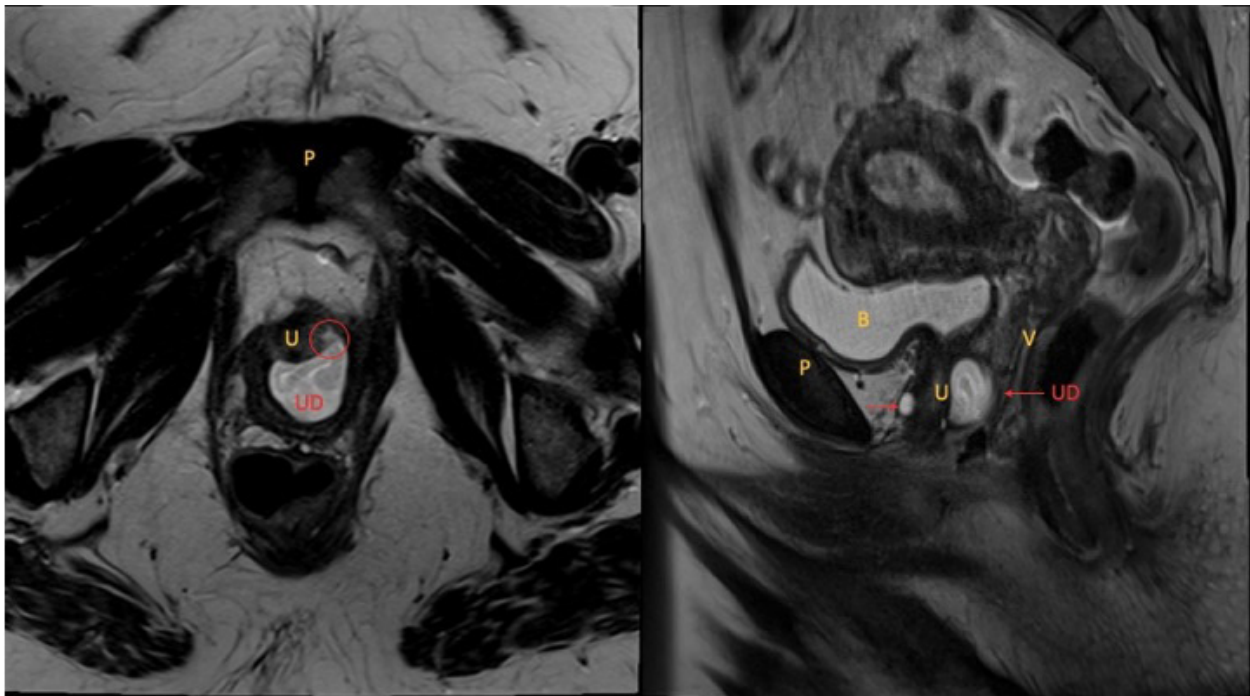


Figure 3. Complex urethral diverticulum with ostia (circled) noted on T2-weighted contrast enhanced MRI. *U*, urethra. *B*, bladder. *P*, pubic bone. *V*, vagina.

alization of the ostium during cystourethroscopy only occurs in 42% of cases on average.^{31,35}

Urodynamics may be used to evaluate patients who have urinary incontinence uncharacteristic of the post-void dribbling commonly associated with urine retained within the UD. **Approximately 50% of women with UD will have SUI demonstrated on urodynamics.**^{10, 11, 42} **Furthermore, UD may mask clinically significant urinary incontinence in up to 33% of women.**²⁴ **When combined with fluoroscopy, the micturition**

phase of urodynamics functions as a VCUg and can also be used to diagnose UD during the initial patient evaluation.³⁵

While urodynamics provides useful information that may help guide treatment of patients with UD, especially if a concomitant anti-incontinence surgery is being considered, it often is costly, is uncomfortable and exposes the patient to ionizing radiation if done with fluoroscopy. Additionally a recent study found that although 29% of patients with UD had SUI demonstrated on preoperative urodynamics, almost 60% of those patients expe-

rienced resolution of the SUI 1 year after vaginal diverticulectomy with or without conservative therapy.⁴³

SURGICAL MANAGEMENT OF URETHRAL DIVERTICULUM

Although observation of asymptomatic UD without suspicious examination findings is acceptable, most UD are treated surgically.^{20, 44} **Since the natural history of UD is unknown, women who elect for conservative management should be counseled regarding the risk of associated malignancy and other complications such as acute abscess or stone formation.**^{11, 35} As mentioned previously, a urinalysis and urine culture are indicated preoperatively. Patients should be treated with the appropriate antibiotics 1–2 weeks prior to surgical management as there is a high incidence of infection associated with UD.^{1, 10, 20, 35} If atrophic vaginitis is identified during the initial examination, topical vaginal estrogen cream can be started a few weeks prior to surgery to improve tissue quality.^{1, 10} Those patients who present with an acute diverticular abscess, especially during pregnancy, can be treated with transvaginal aspiration or incision and drainage of the UD with antibiotic therapy, and some surgeons advocate delaying definitive surgical management for 3 months after abscess resolution.^{11, 20}

Alternative surgical management of urethral diverticula. The main surgical technique used to treat UD is transvaginal diverticulectomy but alternative approaches include transurethral endoscopic incision/unroofing and marsupialization.^{10, 35, 44, 45} Transurethral unroofing has been described in a small number of studies and in only a few patients with varying degrees of success.⁴⁴ Marsupialization can sometimes be used to treat distal UD by first making an incision into the vaginal aspect of the UD with subsequent drainage of the contents. The diverticular wall is then sutured open to prevent reformation of the sac and, since the distal location of the ostium is beyond the external sphincter, the patient is usually able to maintain continence.

Transvaginal diverticulectomy. **The goals of a transvaginal diverticulectomy are to excise the entire diverticular sac, identify the ostium and close the urethra in a watertight fashion, perform a 3-layer tension-free closure with care to close any dead space and avoid overlapping suture lines, and preserve or restore continence.**^{10, 11, 45} Images should be reviewed prior to beginning the operation and culture specific intravenous antibiotics should be infused. The patient is usually placed in a dorsal lithotomy position, although some describe using a Sims position or in some instances converting to a prone position after the endoscopic portion.^{6, 20, 35}

Rigid cystourethroscopy using a lens of 30 degrees or less is then performed to attempt to identify the diverticular ostium. Vaginal compression of the diverticulum may help to distend or express contents from the ostium to aid in its identification, while vaginal compression of the bladder neck with the irrigation running can help to distend the urethra, further assisting its identification.^{20, 46} **If the ostium is identified, some find it useful to instill it with methylene blue dye or cannulate it with a small catheter for identification during later dissection and, in the case of the dye, stain the inner lining of the sac to help ensure complete excision.**^{1, 20, 35} The diverticular ostium cannot always be identified. Surveillance cystoscopy should also be done to identify the trigone and note the proximity of bilateral ureteral orifices to the bladder neck.

Ureteral catheters may be placed at this time if the proxi-

mal extent of the urethral diverticulum is noted to be in close proximity to the trigone.^{1, 6, 11, 20} The surgeon may also take the opportunity to fill the bladder and place a suprapubic tube at this time. While this is an optional step, a suprapubic tube can be used for drainage in order to minimize the chance of wound disruption as the urethral catheter can be plugged and secured at the end of the case.¹ It can also be used as primary drainage if the initial postoperative VCUG demonstrates extravasation, eliminating the need to replace the urethral catheter.^{35, 46}

Once cystoscopy is complete, a urethral catheter should be placed for identification of the urethra and ostium during the case. If desired, a weighted vaginal speculum and/or self-retaining retractor (ie Lone Star®) can be placed to assist with exposure and retraction. An inverted U-shaped incision is made in the anterior vaginal wall overlying the urethral diverticulum with the apex near its midpoint. This incision can be extended proximally and laterally as needed depending on the size of the urethral diverticulum. An alternative incision can be done in the midline or T-shaped, and may be preferable if the surgeon anticipates using a Martius flap as a closure layer.^{11, 47}

Hydrodissection with saline or a local anesthetic with or without epinephrine can be used to assist the dissection but care should be taken not to distort the anatomy near the urethral diverticulum (fig. 4).^{6, 10, 11, 20, 35} Using Metzenbaum scissors, the vaginal epithelium is dissected away from the underlying periurethral fascia, creating a flap. Allis clamps used on the epithelial edge can be used to aid with countertraction. The periurethral fascia, which is still overlying the urethral diverticulum and can be used later as a layer of closure, is then incised carefully to avoid inadvertently entering the sac. This incision is usually made horizontally to avoid overlapping suture lines during the closure but it can also be made in the midline if needed.^{1, 10, 20, 46}

The urethral diverticulum is then enucleated from the overlying periurethral fascia using sharp and blunt dissection, again trying to avoid puncturing and decompressing the diverticulum prematurely. Smooth forceps or a Babcock can be used to grasp the diverticulum to aid in this dissection, and retraction hooks can be used on the periurethral fascia to aid in exposure.⁴⁶ The urethral surface of the urethral diverticulum must also be dissected off the outer wall of the urethra until the neck of the ostium is the only part still attached. With larger and complex UD, or when the dissection proves difficult, it may be necessary to enter the sac. Incising the sac in the midline allows for improved delineation of the lateral and anterior borders and can aid in identification of the ostium.^{11, 46} Although the goal is to remove the entire diverticular wall, since residual wall is thought to contribute to recurrent UD, it may be better to leave the proximal wall of larger UD that would require extensive dissection near the bladder base, trigone and ureters.^{10, 35, 46} Once the diverticulum is excised at the site of the ostium, the urethral catheter may be visible through the urethral defect. If it is not, and the urethral defect is not easily identified, a lacrimal duct probe can be used to attempt to cannulate it.⁴⁶ Additionally saline with or without added dye can be injected through the urethral meatus, alongside the urethral catheter, so that fluid extravasation from the external defect can be seen (fig. 5).^{10, 20}

During closure care should be taken to do a tension-free closure and avoid overlapping suture lines to reduce the risk of wound disruption and fistula development (fig. 6).^{10, 35} **The defect should be closed using 4-zero synthetic absorbable**

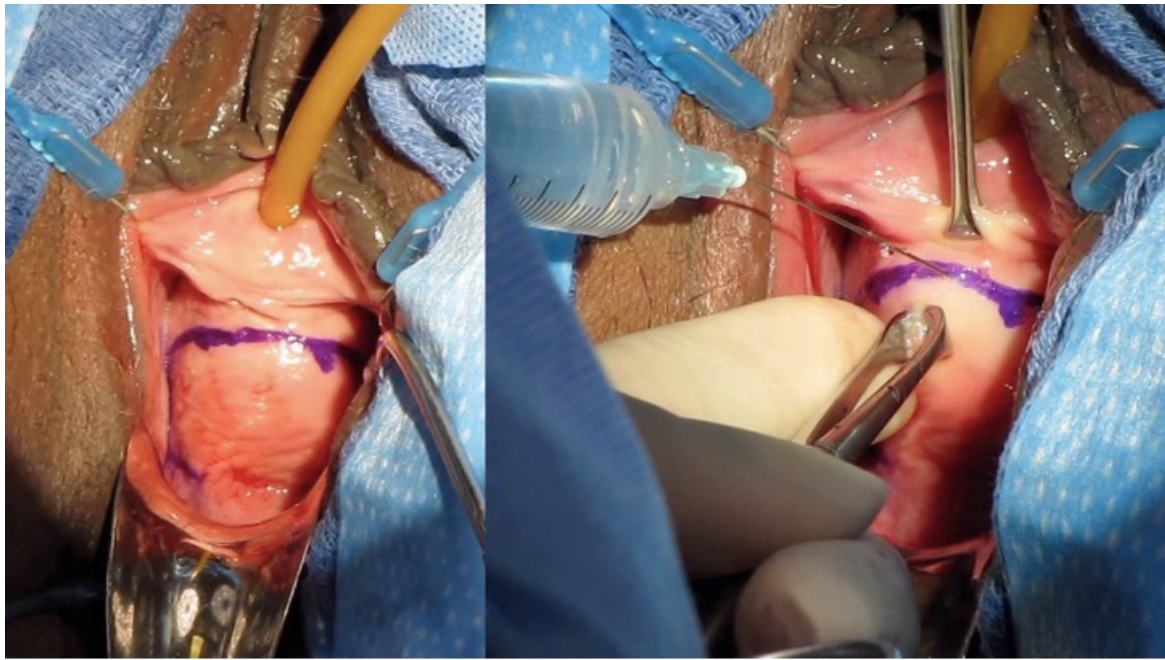


Figure 4. Anterior vaginal wall overlying urethral diverticulum marked with inverted U for incision. Lateral paravaginal spaces are hydrodissected along UD.

suture and the same saline technique described above should be used to ensure the closure is watertight. The periurethral fascia is then closed using 3-zero synthetic absorbable suture. In cases where the periurethral fascia cannot be used or may not provide sufficient protection, a Martius flap may be harvested and used as a second or additional layer of closure.^{10,35,46,47} Additionally if the patient requires concurrent surgical management

of SUI, an autologous sling can be used as a layer of closure.^{20, 23} The vaginal epithelium is then closed using 2-zero synthetic absorbable suture and a vaginal pack is placed. The urethral diverticulum should be sent for pathological evaluation.

Special considerations. UD vary in size and configuration, ranging from small and simple to large and complex. Generally a urethral diverticulum is considered complex if it is proximal

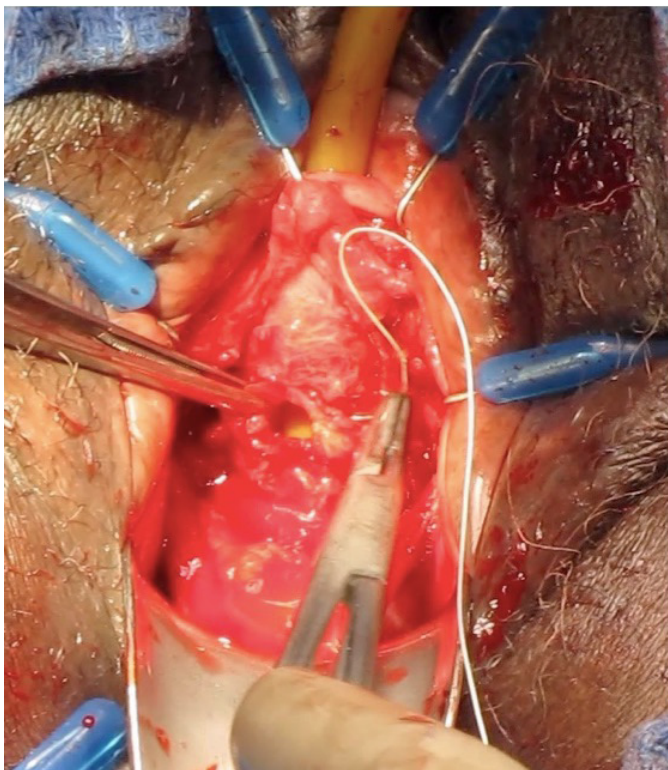


Figure 5. Repairing urethral defect once entire urethral diverticulum is excised.

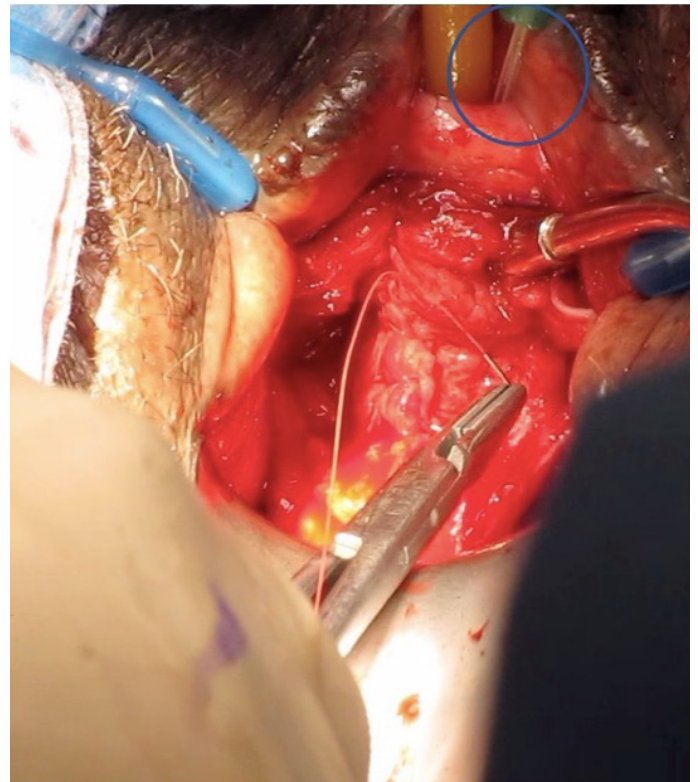


Figure 6. 18 Gauge angiocatheter is used to ensure closure of urethra is watertight. Stitch is being placed in area that was found to leak.

or mainly anterior/dorsal along the urethra, has loculations, is >3 cm in diameter, has a possible association with prior pelvic or vaginal surgery including prior diverticulectomy, has a horseshoe configuration where it forms a periurethral U-shape and can extend asymmetrically in all directions or has a circumferential shape, or more than 1 diverticulum is present.^{11,48,49} While the technique and surgical tips described can be used to treat and completely excise complex UD, a variety of surgical modifications and approaches have been successfully implemented for more challenging cases. Retropubic and transabdominal robotic approaches have been described to treat UD with large anterior and proximal components to improve exposure, although a transvaginal counter-incision may still be required.^{48, 50, 51} A technique described by Rovner and Wein involves complete division of the urethra with primary end-to-end urethroplasty and Martius flap coverage in order to completely excise circumferential UD.⁵²

Malignancy. Most UD are benign with histopathological findings of acute and chronic inflammation, nephrogenic adenoma and squamous metaplasia.^{3,37,38} The most common malignancy identified within UD is adenocarcinoma, followed by squamous cell carcinoma and urothelial carcinoma. This is in contrast to primary urethral cancers, which are most commonly urothelial carcinomas.^{17,53} In the few cases where malignancy was identified after diverticulectomy the literature reports a variety of treatment regimens including subsequent anterior exenteration and urinary diversion, although there is no current consensus regarding this rare entity.^{20,26}

Concurrent stress incontinence. As previously mentioned, SUI may be a presenting symptom or a masked diagnosis associated with UD that may be addressed concurrently. The safety and efficacy of placing an autologous pubovaginal sling at the time of diverticulectomy was first reported by Swierzewski and McGuire in 1993, and this has since been confirmed by multiple series over the years.^{23,35,54} The literature reports 80%–100% cure rates of SUI when these procedures are done concurrently.^{20,23,54} While concurrent autologous sling placement allows the patient to potentially avoid another surgical procedure, doing so also increases the operative time and potential intraoperative and postoperative complications. There are no risk factors that have been identified that can predict persistent or de novo postoperative SUI. However, UD in close proximity to the urethral sphincter or complex (horseshoe or circumferential) UD may result in damage to the muscle complex during excision. Although concurrent autologous sling placement is feasible and well accepted, patients should be made aware that SUI symptoms can often resolve with diverticulectomy alone and that new onset voiding dysfunction is associated with fascial slings.^{6,43} The decision to proceed with a concurrent sling requires shared decision making between the urologist and patient once the risks and benefits have been discussed. **The use of synthetic mesh sling during diverticulectomy is contraindicated.**⁵⁵

Postoperative management. Postoperative management after transvaginal diverticulectomy generally involves overnight observation with parenteral antibiotics, removal of the vaginal pack on postoperative day 1 and discharge home with

the catheter(s) in place. Anticholinergics can be prescribed to reduce bladder spasms, and patients should be advised to take stool softeners or gentle laxatives to prevent straining with bowel movements. **The urethral catheter is usually left in place for 2–3 weeks, and a VCUG is usually performed after urethral catheter removal to assess for urine extravasation or other urethral anatomical abnormalities.** If extravasation is seen, the urethral catheter is usually replaced and left for another 1–2 weeks before repeat VCUG, although this is not necessary if a suprapubic catheter is already in place for drainage. Patients may continue to use intravaginal topical estrogen throughout the postoperative period but should be advised to avoid placing anything else in the vagina for 6 weeks.

Potential complications of surgery. Intraoperative complications may include injury to the urethra and/or sphincter complex, ureters and/or bladder. Early postoperative complications that may arise from surgery include UTI and surgical site infection. **Late complications include de novo SUI, which is the most common and occurs in up to 33% of patients, urethral fistula formation, which is reported in 0.9%–8.3% of cases and is most devastating when proximal to or involving the urethral sphincter, recurrent UD formation in up to 22% of patients and urethral stricture in up to 5.2% of cases.**^{1, 3, 6, 10, 56, 57} Additional reported complications include persistent or new onset vaginal pain and/or dyspareunia, new onset voiding dysfunction, lower urinary tract symptoms and persistent or recurrent UTIs.^{1,10,11,20,58} **In the case of urethral fistulae requiring surgical management there is no consensus on the optimal time for repair. However, it is usually performed around 3 months after the original surgery so that tissue quality is optimized and also often involves the use of a Martius flap for coverage.**^{10,46}

Results and outcomes. **Transvaginal diverticulectomy has a cure rate of around 86%–98% and is a well tolerated procedure.**^{1,10,42,46} Although the aforementioned complications may occur, these occur at a relatively low rate and are often manageable. Subsequently it has been found that more than 90% of women who underwent transvaginal diverticulectomy would recommend the surgery to a friend.¹¹ Additionally, although UD recur after up to 22% of cases, meta-analysis of the rates indicated that recurrence is observed in around 9.8% of all patients, including those undergoing repeat diverticulectomy.³⁵

CONCLUSION

Female urethral diverticula are a rare and complex genitourinary pathology that may present with a heterogeneous constellation of symptoms. Expedient diagnosis depends on a high index of suspicion, and the diagnosis is best confirmed using pelvic MRI. Although in a few cases UD may be managed conservatively, transvaginal diverticulectomy is the most commonly used method of treatment, with excellent cure rates and low long-term complications. Management of SUI in patients undergoing diverticulectomy may be accomplished by concurrent autologous pubovaginal sling placement, again with high cure rates for both.

DID YOU KNOW?

- Female urethral diverticula often present with a variety of lower urinary tract symptoms, recurrent urinary tract infections and a periurethral bulge on physical examination. The classic triad of dysuria, post-void dribbling and dyspareunia often is NOT present, and some cases may be asymptomatic.
- Magnetic resonance imaging of the pelvis with and without intravenous gadolinium based contrast medium is the gold standard to diagnose urethral diverticula, with T2-weighted sequences providing the best images.
- Transvaginal diverticulectomy is a well tolerated surgery with a high cure rate and low complication rate. The goal of surgery is to completely excise the diverticula, perform a watertight closure of the urethral defect, perform a 3-layer tension-free closure with attempts to avoid overlapping suture lines, and preserve or restore continence.
- Concomitant autologous pubovaginal sling may be performed in appropriately selected patients to manage bothersome stress urinary incontinence, although patients should be educated that the incontinence may resolve with diverticulectomy alone. Synthetic mesh slings should not be used at the time of diverticulectomy.

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Study Questions Volume 39 Lesson 34

1. The gold standard imaging modality for a urethral diverticulum is
 - a. VCUG
 - b. transvaginal ultrasound
 - c. MRI with or without contrast
 - d. double-balloon urethrography
2. The type of incontinence characteristic of a urethral diverticulum is
 - a. urge incontinence
 - b. stress incontinence
 - c. mixed incontinence
 - d. post-void dribbling
3. The most common complication following a urethral diverticulectomy is
 - a. dyspareunia
 - b. urethral stenosis
 - c. urethrovaginal fistula
 - d. stress urinary incontinence
4. A 46-year-old woman has bothersome stress urinary incontinence and is interested in surgical repair. On physical examination a urethral diverticulum is incidentally found. The recommended treatment option is
 - a. periurethral bulking
 - b. synthetic mid urethral sling
 - c. urethral diverticulectomy and synthetic mid urethral sling
 - d. urethral diverticulectomy and autologous pubovaginal sling
5. If the periurethral fascia cannot be used for an added layer of closure, the next best option is insertion of
 - a. a Martius flap
 - b. a vaginal mucosal flap
 - c. a mid urethral sling
 - d. an autologous pubovaginal sling