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Management of Ureterovaginal and Vesicovaginal Fistulas after Abdominal or Pelvic Surgery

Learning Objective: At the conclusion of this continuing medical education activity, the participant will be able to define the incidence, risk factors and procedures associated with ureterovaginal and vesicovaginal fistula development; describe approaches to the intraoperative and/or postoperative identification, management, timing of repair and postoperative management of ureterovaginal and vesicovaginal fistulas; and discuss techniques for the prevention of fistula development.

This AUA Update aligns with the American Board of Urology Module on Neurogenic Bladder, Voiding Dysfunction, Female Urology, BPH and Urethral Stricture. Additional information on this topic can be found in the AUA Core Curriculum sections on Reconstructive Urology and Trauma.

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URETEROVAGINAL FISTULA

Introduction. Ureterovaginal fistula (UVF) is an abnormal communicative tract between the ureter and vagina. While less common than urogenital fistulas involving the bladder, this diagnosis is nevertheless associated with significant symptoms including persistent urinary incontinence, infection, disability and distress. As the incidence of such injuries has been increasing over the past 2 decades, a high clinical index of suspicion and careful evaluation are the cornerstone of diagnosis and management.[1]

Etiology and epidemiology. **The most common cause of UVF is iatrogenic trauma to the ureter during abdominal or pelvic surgery with abdominal hysterectomy representing the most commonly involved surgery.** Nonsurgical causes including vaginal delivery, oocyte retrieval for infertility treatment and retained pessary have been implicated.[2] Chen et al estimated that 0.4% of hysterectomies were associated with UVF.[3] **Additional risk factors include locally advanced malignancy, prior radiation therapy, pelvic trauma, obesity, endometriosis and pelvic inflammatory disease.[4-6]** Brummer et al in a large series of 5,279 patients reported a 0.2% incidence of ureteral injury following benign hysterectomy, with a lower rate among vaginal hysterectomy when compared to an abdominal approach.[7] There was no difference in incidence between open abdominal and laparoscopic hysterectomy. In a series from the United States, the overall incidence of ureteral injury following radical hysterectomy was 0.8%.[8]

Mechanism of intraoperative injury. **UVF development typically occurs at the level of the pelvic ureter as it lies in relation to the structures of the female pelvis including the uterosacral ligament, uterine artery, cervix and vaginal fornices.[5]** The fistulization process begins from interruption of the distal ureteral blood supply, resulting in devascularization of the ureter followed by ureteral tissue ischemia and necrosis. Damage to the ureteral blood supply is caused by ureteral transection or laceration, electrocautery or vascular sealing devices, partial or complete suture ligature, or crush injury from forceps. The risk of injury is higher during laparoscopic procedures near the infundibulopelvic and cardinal ligaments as the ureter passes inferior to the uterine vessels.[9] Injury to the ureter or development of necrotic segments is followed by urinary leakage, especially if there is concomitant distal obstruction, as from a ligating suture or clip. This leads to urinoma formation and fistula development as the urine collection extends toward the suture line of the vaginal cuff. Risk factors for intraoperative ureteral injury include adhesions from prior pelvic surgery, infection and surgical field radiation-induced changes.[10] **The majority of injuries are identified postoperatively and thus associated with higher morbidity.[4]**

Intraoperative diagnosis, management and prevention. Early recognition of ureteral injury and immediate repair—at the time of primary surgery when possible—helps to minimize subsequent morbidity and complications. One effort to minimize ureteral injury is the use of prophylactic ureteral stents/catheters. **However, several studies have failed to demonstrate a significant difference in the incidence of ureteral injury following their use.[11]** Chou et al examined ureteral stent placement in 3,141 women undergoing open or laparoscopic gynecologic surgery and found a nonstatistically significant difference in injury rate of 1.2% (with stents) compared to 1.1% (no stents).[12] Merola et al reported in a review of 374 patients undergoing open colectomy an overall rate of ureteral injury of 0.3%.[13] They also noted longer operative times and a higher rate of new-onset urinary complications in stented patients. More recently, the role of lighted ureteral stents has been evaluated. In a retrospective review of 465 laparoscopic colorectal surgeries over a 5-year period in which lighted ureteral stents were utilized, the authors reported that the stents could be identified in all cases with no ureteral injury identified.[14]

The principles of intraoperative management of ureteral injury and UVF prevention are based on the recognition of injury and evaluation of the bladder and contralateral ureter for associated injuries.[15] This can be performed by direct inspection for fluid accumulation in the operative field as well as an endoscopic evaluation for ureteral jets or via attempted passage of ureteral catheters into the upper tracts or with retrograde ureteropyelography. **In a prospective study, cystoscopy with indigo-carmine injection and demonstrated efflux was able to detect ureteral injury in 97.4% of cases.[16]** Cystoscopy also allows for a simultaneous evaluation for bladder injury.

Distal ureteral injuries require ureteral reimplantation given poor healing of injuries in this location based on the tenuous blood supply of the distal ureter and the tendency to form strictures. Ureteral contusions of proximal ureteral injuries may be managed with ureteral stents while partial and complete transections of the mid-ureter require primary repair with ureteroureterostomy over a stent.[17] Depending on the length, location and severity of the injury, adjunctive procedures may be required. Intraoperative thermal injury requires ureteral stenting at a minimum given the risk of obstruction from edema and the potential for delayed necrosis.

Delayed presentation and diagnosis. Patients often present with continuous urinary incontinence from the vagina 1 to 4 weeks after surgery.[10] Other symptoms include fevers, flank pain, nausea and emesis related to upper tract obstruction, and urinoma. UVF can be distinguished clinically from other urogenital fistulas in that normal voiding function is maintained and the patient experiences normal bladder cycling from filling by the contralateral renal unit.

Definitive diagnosis can be made based on a careful history, physical examination and upper tract imaging using computerized tomography urogram, magnetic resonance urogram or retrograde ureteropyelography. Percutaneous nephrostomy (PCN) placement with antegrade nephrostography may be utilized, particularly if there is distal obstruction severe enough to preclude retrograde assessment. Failure of retrograde catheter placement indicates possible total obstruction and increases the risk of failure when conservative measures (ie Foley catheter only) are utilized. Fluid assessment for creatinine may demonstrate an elevated level compared with serum values. A double dye test, described below, can help differentiate UVF from other urogenital fistulas (see section on vesicovaginal fistula

ABBREVIATIONS: percutaneous nephrostomy (PCN), ureterovaginal fistula (UVF), vesicovaginal fistula (VVF)

[VVF]). Imaging may be associated with signs of obstruction including hydronephrosis and a delayed nephrogram.[18] Pooling of contrast material within the vagina may be demonstrated, and failure to opacify the distal 3–4 cm of the ureter is suggestive of UVF (fig. 1, *A* and *B*). Plain film or computerized tomography cystography along with cystoscopy is helpful to rule out a concomitant VVF, which can be seen in up to 10% of cases.[19]

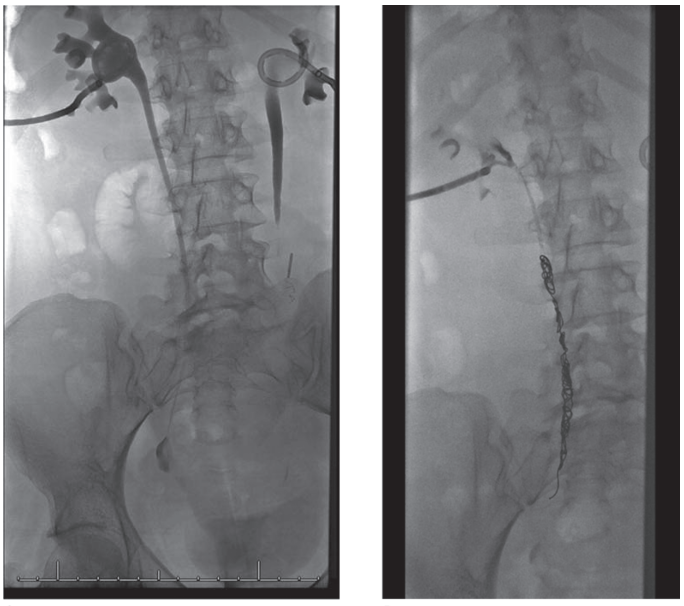
Treatment. Conservative/Endoscopic Therapy: **These fistulas are unlikely to resolve spontaneously without decompression and drainage of the upper urinary tract.** In patients who do not have definitive repair at the time of surgery and present with delayed diagnosis, ipsilateral urinary drainage is warranted. This can be achieved by retrograde ureteral stent placement, PCN placement or antegrade ureteral stent placement.[3,20] PCN may also be utilized in the patient who is too ill or unstable for a general anesthetic.[21] Retrograde stent placement can be aided by ureteroscopic-guided wire advancement through the ureteral lumen if wire placement is unsuccessful through fluoroscopy alone. In a series of 84 patients, successful stent placement was reported in only 9% of cases with 63% of these undergoing resolution with stent placement alone.[22] The stricture rate in this series was 38%. In the series by Shaw et al, 13/19 cases (68%) were treated conservatively with initial stent placement, with successful stent placement in 7/13 (54%) cases and fistula resolution in 5.[15]

Spontaneous healing, following a trial of drainage for 4–8 weeks, is more likely when the obstruction is low-grade, the ureter is continuous and urinary extravasation is mild. **The resolution rate with PCN placement is approximately 50%, while ureteral stenting results in healing in 50% to 70%.[21]** Patients experiencing resolution of the UVF require ongoing followup for stricture development and the potential for silent hydronephrosis and obstruction.

Surgical Therapy: There is a trend toward earlier repair for uncomplicated gynecologic fistulas except where factors related to poor local tissue quality necessitate delayed management. In a review of 52 patients, Yu et al reported on early surgical repair of UVF following gynecologic surgery with repair occurring between 2–3 weeks.[23] All surgical repairs were uneventful with no major complications and preserved renal function in all patients. Critically ill patients complicated by urosepsis and azotemia are better managed following resolution of clinical acuity.[21]

Given that most UVFs involve the distal third of the ureter, the most common technique for repair involves ureteroneocystostomy.[18] Antirefluxing anastomoses are not required and may increase the risk of ureteral stricture. Adjunctive maneuvers including psoas hitch or Boari flap may be utilized to bridge gaps in ureteral length in addition to the use of transureteroureterostomy, ileal ureteral substitution (fig. 2), augmentation cystoplasty (small capacity, poorly compliant, radiated bladders) and autotransplantation. **A poorly functioning renal unit with unsalvageable function may be more appropriately treated with nephrectomy.[10]** More recently, minimally invasive techniques using laparoscopic and robot-assisted approaches have been used in an effort to reduce pain, hospital stay and convalescence, with early results demonstrating outcomes comparable to the open approach.[24,25]

Postoperative management. Urinary drainage is paramount to a successful repair and outcome. The catheter should be maintained for 7–14 days and healing confirmed with cystography prior to catheter discontinuation. Antimuscarinics may be considered to inhibit bladder spasms. The ureteral stent should be removed via cystoscopy after 6–8 weeks. Ongoing monitoring of renal function and interval imaging with renal



A B

Figure 1. *A*, left-sided UVF is demonstrated during endoureteral coil embolization procedure. Contrast material is seen extravasating from distal ureter and collecting within vaginal vault. *B*, Post-coil embolization is demonstrated.

Figure 2. Postoperative cystogram of patient from figure 1 shows opacification of bladder and ileocystoplasty in addition to substitution ileal segment used for ureteral reconstruction. Indwelling ureteral stent is visualized.

ultrasonography and diuretic renography helps to detect ureteral stricture, hydronephrosis and changes in renal function.[3] In our practice, we follow patients at 3, 6 and 12 months with clinical examination, renal ultrasound and a basic metabolic panel.

VVF

Introduction. VVF is an abnormal communicative tract between the bladder and vagina and represents the most commonly acquired fistula of the urinary tract.[26] These fistulas result in debilitating and unremitting urinary incontinence and produce significant physical, psychological and social distress, including isolation.[26,27]

In developed nations, the etiology of VVF is most often iatrogenic following injury to the bladder at the time of abdominal or pelvic surgery including general surgical, urological, gynecologic and colorectal procedures.[28,29] Secondary causes include radiotherapy and malignancy.[30] Post-radiation VVF (fig. 3), often presents late and can be highly challenging to manage with repair failure rates as high as 50%. **Pelvic radiation leads to tissue ischemia due to radiation-induced endarteritis obliterans along with bladder fibrosis.[10,27]** This Update will be limited to discussion of these fistulas.

Etiology and epidemiology. In addition to iatrogenic trauma, other risk factors for postoperative VVF include local infection, endometriosis, diabetes, obesity, prior uterine surgery, arteriosclerosis, pelvic inflammatory disease and prior radiation therapy.[10] In a systematic review by Hilton it was reported that 83.2% of VVF cases were related to iatrogenic injury.[31] **The most common procedure associated with the development of VVF is abdominal hysterectomy, comprising up to 75% of all cases with more for benign (60%–75%) compared with malignant (30%) conditions.** The reported rate of postoperative VVF following abdominal hysterectomy is 0.5%–2%.[27] In a meta-analysis of 1,430 patients, the surgical etiology of VVF was abdominal, vaginal and laparoscopic hysterectomy in 66% (940), 9% (126) and 3% (38) of cases, respectively.[26] **Cesarean section has a 6% VVF rate and is most commonly associated with vesicouterine fistulas.[10]** Other common pelvic surgeries associated with VVF include cystocele repair and anti-incontinence surgery. In addition to surgery, approximately 3%–5% of VVF occurrences can be related to locally advanced malignancy, with cervical, vaginal and endometrial cancers being the most common.[29]

Figure 3. Cystoscopic view of radiation-induced VVF.

Mechanism of intraoperative injury. **VVF following abdominal hysterectomy is most commonly related to an unrecognized bladder injury near the vaginal cuff.[32]** Tissue ischemia and necrosis from excessive cautery or suture ligature during cases with excessive bleeding may be contributory.[10] The injured, ischemic bladder tissue becomes necrotic, leading to urinoma formation with subsequent drainage into the vagina, through the cuff incision, followed by persistent leakage, epithelialization and fistula tract maturation.[21]

Intraoperative diagnosis, management and prevention. Intraoperative bladder injury may be identified by persistent bleeding or fluid accumulation in the surgical site near the bladder in proximity to the vaginal cuff posteriorly.[33] Ibeanu et al demonstrated that visual inspection of the surgical field is less sensitive than cystoscopy (38% vs 96%) in detecting injuries and should be considered during evaluation.[16] The intravenous administration of methylene blue or indigo carmine may assist with the identification of the iatrogenic cystotomy.[28] Alternatively, the injection of a vital dye through the bladder catheter can help reveal an area of leaking. **More than 10% of bladder injuries are associated with ureteral injury, and therefore an evaluation for ureteral efflux or the passage of ureteral catheters to confirm patency is recommended.[21,27,29] Following identification, multilayered repair with absorbable suture in a nonoverlapping, watertight, tension-free manner with adequate urinary drainage is essential.** Ureteral stenting may be employed if the injury or repair approximates the ipsilateral ureteral orifice. Careful hemostasis to prevent postoperative hematoma is crucial.[27] The appropriate management of bladder injury at the time of primary surgery is associated with a significantly reduced risk of postoperative VVF, with 97% of injuries healing without fistula formation.[34]

Delayed presentation and diagnosis. Symptoms of severe abdominal pain, distention, ileus, bladder irritability and hematuria postoperatively should prompt suspicion of a missed bladder injury and require investigation.[10] The most common symptom and sign in patients with postoperative VVF is persistent urinary leakage from the vagina. The degree of continuous incontinence is variable depending on the size and location of the fistula. **Symptoms may not appear until 7–10 days after the initial surgery as the tissue ischemia progresses and necrosis develops.[35]** Some patients may not experience total incontinence as all urine draining into the bladder leaks through the fistula, while others may experience leaking that is intermittent or positional. Skin irritation and fungal infection from chronic wetness to the genital and perineal region may occur. Some patients may present in a delayed fashion due to vaginal, peritoneal or lymphatic fluid discharge from vaginitis, peritoneovaginal fistula or lymphatic fistula, respectively.[36] Radiation-induced fistulas may not appear for months to years, even up to 20 years, following completion of therapy.[21]

A careful history and physical examination along with endoscopic and radiological investigations is critical to accurately diagnose and stage postoperative VVF. Cystoscopy and vaginoscopy help visualize the location, size and number of fistulas (fig. 4).[28,27] **Most VVFs following hysterectomy are located along the anterior vaginal wall near the cuff.[10]** The presence of inflammation or infection surrounding the fistula will delay the timing of repair as these factors reduce the likelihood of a successful repair. Vaginal anatomy is assessed for tissue quality,

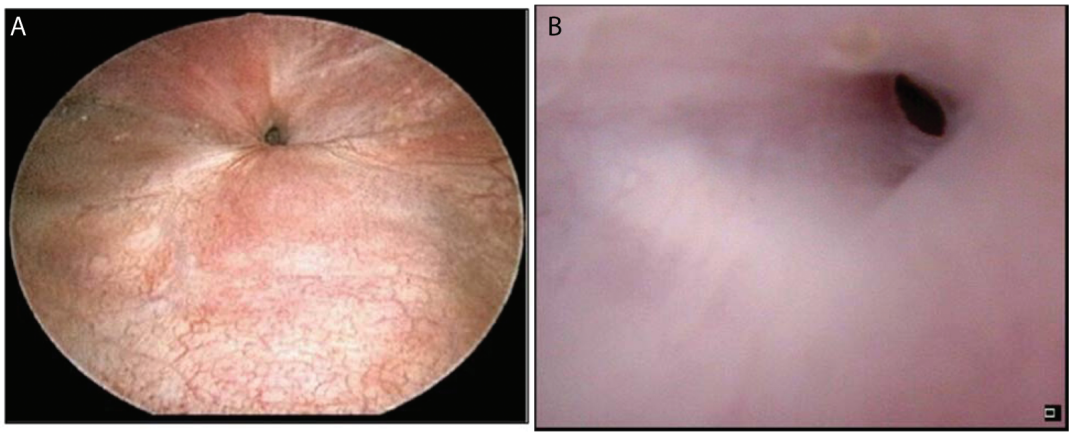


Figure 4. *A,* cystoscopic view of VVF. *B,* vaginoscopic view in same patient.

size of the introitus and depth of the vaginal vault as this will influence the choice of operative approach and the potential for postoperative sexual dysfunction. Laboratory tests including urine culture and urine cytology are helpful in ruling out infection or recurrence of malignancy. If there is doubt regarding the source of the vaginal fluid, it can be analyzed for its creatinine level, with elevated values suggesting a leak.[21]

The use of a double dye (tampon) test can help distinguish between vesicovaginal, ureterovaginal and urethrovaginal fistulas. In this test, a tampon is placed in the vagina, oral phenazopyridine is administered and a vital blue dye is injected into the bladder by catheter. The color of the dye on the tampon and the relative location help distinguish the above. Yellowish-orange dye at the proximal portion of the tampon suggests a UVF, while blue discoloration at the mid-portion suggests VVF. Distal blue discoloration may suggest either urethrovaginal fistula or urinary incontinence.[10,28]

Cystourethroscopic evaluation may reveal bullous edema without a distinct ostium (immature fistula) or a well-defined ostium (mature fistula). A guidewire or ureteral catheter can be advanced through the fistula tract to confirm passage into the vagina, noting the location.[27] **In the case of fistula following treatment for malignancy, biopsy of the fistula tract is an essential component of evaluation to rule out recurrence.[36]**

Imaging for VVF may include computerized tomography or magnetic resonance imaging. A computerized tomography urogram or computerized tomography cystogram may reveal contrast medium collecting within the vagina with or without an obvious fistula tract opacified by contrast.[27] A concomitant UVF may be demonstrated on upper tract contrast filling. Plain film radiography including cystogram or voiding cystourethrogram may be utilized if cross-sectional imaging is unavailable or contraindicated (figs. 5 and 6). It is important to obtain images in multiple views with voiding and post-voiding images; otherwise, the images may result in a nondiagnostic study. It is important for the clinician to be cognizant of vaginal voiding and contrast reflux, which would produce a false-positive result. While urodynamic studies are not required in the evaluation of VVF, patients with a history of prior radical pelvic surgery, radiation therapy, anti-incontinence surgery or neurogenic bladder dysfunction may benefit from a detailed assessment of bladder capacity, compliance and detrusor activity.[10]

Treatment. The goal of VVF treatment is the resolution of the fistula tract and restoration of lower genitourinary tract function. The initial attempt at repair is unequivocally the best chance at cure, and therefore careful evaluation and attention to the principles of fistula repair are critical to achieving definitive resolution.[36] There is no single approach to repair that is

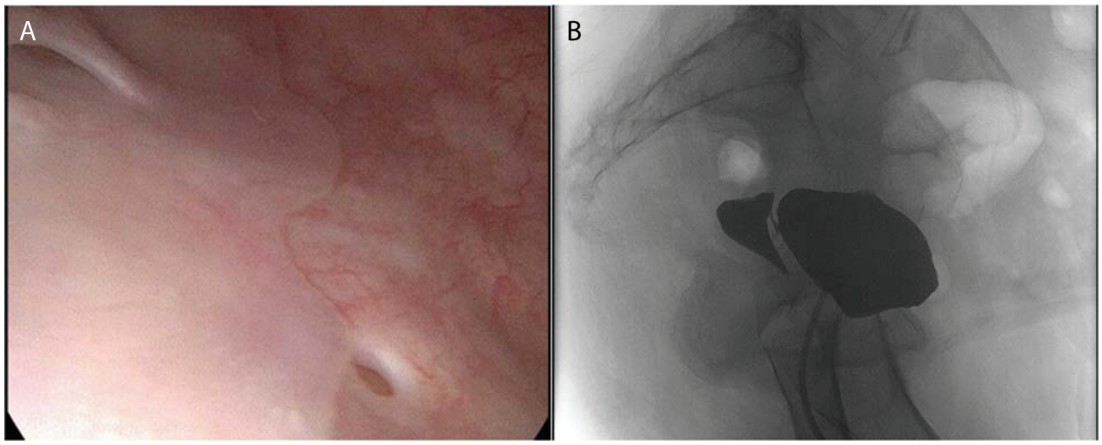


Figure 5. *A,* cystoscopic view of VVF (VVF at left upper aspect of image, with left ureteral orifice seen at lower right aspect). *B,* sagittal view plain-film cystogram of same patient demonstrates contrast extravasation through well-defined fistula into vaginal vault.

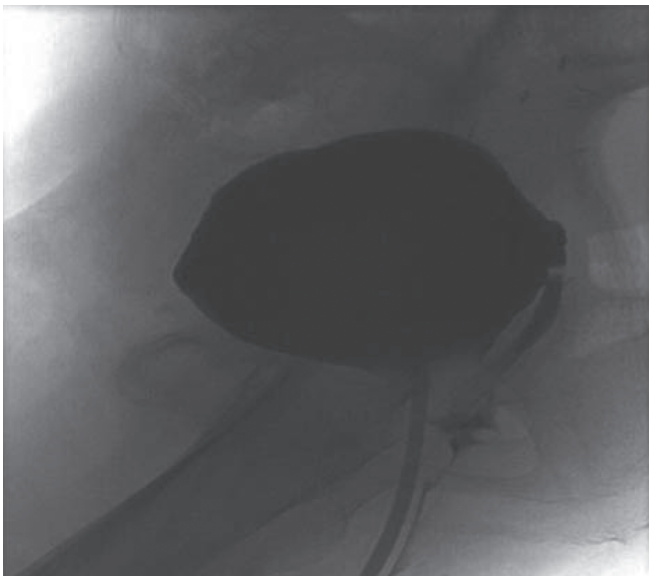


Figure 6. VVF in 66-year-old female with history of cervical cancer treated with chemoradiation.

suitable to all patients or fistulas, and therefore tailoring the approach to the particular clinical scenario is essential.[37]

Conservative Therapy: Bladder catheterization in the immediate postoperative period following diagnosis may provide temporary relief of persistent urinary leakage but is often insufficient to control leakage associated with large fistulas or if there is concomitant detrusor overactivity.[38] **Indwelling catheterization for 2 to 6 weeks along with anticholinergic therapy may lead to spontaneous closure of the fistula tract, particularly if the fistula tract has not yet epithelialized and distal obstruction is excluded.[39]** Wang and Hadley reported closure rates of 11% to 15% following simple catheterization.[40] Hilton reported a success rate of only 6.9% for spontaneous closure.[31] A multicenter analysis from the Fellows' Pelvic Research Network demonstrated an 11.7% success rate with catheter drainage alone.[37] Hillary et al reported a spontaneous closure rate up to 15%.[41] Patients with persistent high-volume leakage despite a trial of bladder catheterization are unlikely to experience spontaneous fistula closure and therefore should be evaluated for definitive surgical repair.

Minimally Invasive Therapy: Minimally invasive techniques including endoscopic cauterization, instillation of fibrin sealant, laser welding, endovaginal cyanoacrylic glue, fistula tract curettage and platelet-rich plasma/rich-fibrin glue application have been described with success rates of 67%–100%.[26] Endoscopic cauterization of the fistula tract or the instillation of fibrin sealant with post-procedure bladder catheterization for 2–4 weeks in patients with small (less than 2 to 3 mm in diameter) oblique fistulas has demonstrated modest results.[42] Endoscopic cauterization is not recommended in fistulas associated with a thin septum, large VVF, a nonoblique tract or significant inflammation as the risk of failure is high and further damage to the surrounding tissue increases the risk of enlarging the fistula and complicating future attempts at repair.[29] **Alternatively, a fibrin-based sealant can be injected into the fistula tract to form a plug and halt urinary leakage while the surrounding tissue heals over the plug.[43]** These procedures are an option in patients given the reduced morbidity and length of hospital stay or for patients who are not candidates for surgical correction. Minimally invasive techniques should be avoided in cases of VVF related to malignancy or recurrence as the failure rate remains high.[44]

Surgical Therapy: Prior to surgical correction, careful attention to patient and fistula related factors that will impact healing is critical. Infection should be treated with a sufficient duration of antimicrobial therapy. Modifiable risk factors for impaired healing including poor nutritional status, smoker status, immunosuppression and poor glycemic control should be corrected, if possible, prior to surgery.

While the overall consensus among the literature has shifted toward earlier repair, the precise definition of "early" repair remains variable.[21] **Generally, if the VVF is identified and confirmed within 2–4 weeks, then immediate repair is recommended.** For fistulas diagnosed after 4 weeks, a reasonable period of delay of 2 to 3 months is recommended.[35] Uncomplicated post-gynecologic urinary tract fistulas may be repaired as soon as they are identified and fully evaluated. **Patients presenting with complicated fistulas and those associated with radiation therapy remain best managed following a waiting period of 6–12 months for the resolution of postoperative edema and inflammation.[25,35]** Surgeries complicated by abscess or urinoma necessitate active treatment and resolution prior to definitive therapy.

The choice of surgical approach to repair is dependent on factors related to the fistula, including size and location, as well as the anticipated requirement of adjunctive maneuvers. The most common approaches include transvaginal, transabdominal and transvesical repair. In the meta-analysis by Bodner-Adler et al the most common approach was transvaginal in 39%, transabdominal/transvesical in 36%, laparoscopic/robotic in 15% and combined transabdominal-transvaginal in 3% of cases.[26] **There are no randomized trials comparing surgical approaches, and the fistula closure rate appears similar among techniques at about 98%.[31,39,40]**

Advantages of the vaginal approach include reduced complications, morbidity, blood loss and length of hospitalization.[36] Disadvantages of the vaginal approach include poor visualization particularly for proximal fistulas in a deep and narrow vagina near the vaginal cuff and the unfamiliarity of vaginal surgery to some urologists.[10] Patients unable to tolerate dorsal lithotomy or with proximal fistulas in close proximity to the ureter or complicated fistulas involving other intraabdominal organs are better managed transabdominally. Patients requiring intra-abdominal surgery for other indications including bladder augmentation, concomitant ureteral reimplantation or UVF repair and complex or reoperative fistulas are best managed via an abdominal approach.[21]

Historically, excision of the fistula tract was advocated; however, more recent evidence suggests that leaving the scar in situ prevents increasing the size of the fistula following excision.[45,46] Shaker et al in a randomized trial compared excision vs no excision with no statistically significant difference in fistula repair outcome.[47] The use of tissue interposition is often required for complex fistulas or post-radiation fistula repairs to provide well-vascularized tissue to augment the blood supply to ischemic tissue and fill dead space.[16] The various flaps and grafts utilized include peritoneum, gracilis muscle, Martius labial fibrofatty flap, small intestinal mucosa, omental and rectus abdominus flaps.[21,48] Graft selection largely depends on the surgical approach chosen, and the location and severity of

the fistula. Peritoneum is readily available, while omentum may not be available from prior omentectomy during radical pelvic surgery for malignancy. In our practice, we do not routinely perform periodic tissue assessments prior to repair.

More recently, the application of minimally invasive techniques including laparoscopy and robot-assisted laparoscopic procedures has been performed with success rates up to 86%. The improved visualization in the deep pelvic space along with the decreased morbidity and enhanced recovery has propelled these techniques to the forefront of contemporary VVF management. In a small series by Agrawal et al 10 patients underwent robot-assisted laparoscopic VVF repair and all were without fistula recurrence at median followup of 2 years, with no intraoperative complications and a median hospital stay of 1 day.[49]

Postoperative management. Bladder catheter drainage is mandatory and should be maintained for 2 to 3 weeks. Strict attention to uninterrupted drainage is critical and the catheter should be manually irrigated if there is concern regarding impaired drainage. A large caliber Foley catheter (20–22Fr) is sufficient to avoid obstruction. Alternatively, a suprapubic tube can be utilized alone or in conjunction with a urethral catheter. An antibiotic impregnated gauze placed in the vagina postoperatively helps minimize vaginal wall hematoma. Antimuscarinics may be prescribed postoperatively and discontinued prior to voiding trial. A prolonged course of antibiotics is not typically required unless there is obvious concern for persistent infection. Cystography is performed at 2–3 weeks prior to catheter removal to confirm bladder healing.[21]

Outcomes and survivorship. The most common postoperative complications include de novo stress urinary incontinence (16.1%–25%), de novo urinary urgency with or without urge incontinence (12.5%–16.6%), de novo pain/dyspareunia, infection and recurrence.[41] These outcomes are influenced by the approach as scarring around the vagina may impair urethral function and abdominal repair with cystotomy may lead to defunctionalization of the detrusor muscle, resulting in reduced functional bladder capacity.[47]

Overall, the rate of success with VVF management is high, reported by Bodner-Adler et al as ranging from 67%–100% with conservative treatment (catheter drainage and minimally invasive methods), 97.98% with surgical treatment, and 91.63% with prolonged catheter drainage followed by surgery.[26] In the series by Hilton 19/36 patients (53%) with malignant or radiotherapy-induced fistulas had to have surgical repair, and of those patients 95% of the surgeries were successful.[31]

CONCLUSION

Urogenital fistulas are a well-established consequence of surgical misadventure. Recognition of the etiological factors, mechanism of injury and the principles of diagnosis, management and prevention are critical to minimizing patient morbidity and providing a successful outcome.

DID YOU KNOW?

- UVFs and VVFs are associated with significant patient symptoms and disability. Prompt recognition and rapid evaluation followed by early repair are critical to a successful outcome.
- Urogenital fistulas such as UVF and VVF may be encountered following abdominal or pelvic surgery, with abdominal hysterectomy being the most common surgical cause. Several factors contribute to an increased risk of injury, such as radiation therapy, obesity and advanced malignancy.
- Close attention to the surgical principles for fistula repair is critical to optimizing the success of repair, with the initial attempt providing the patient the best initial chance for resolution.

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Study Questions Volume 40 Lesson 39

1. The surgery most commonly associated with a UVF is a
   a. cystocele repair
   b. Burch colposuspension
   c. vaginal hysterectomy
   d. abdominal hysterectomy

2. An intraoperative consultation is obtained to assess a possible ureteral injury in a 36-year-old woman undergoing a laparoscopic abdominal hysterectomy for abnormal uterine bleeding secondary to uterine fibroids. The surgeon calls you intraoperatively as he is concerned about a possible ureteral injury. You, on inspection, note a suture visible deep in the pelvis, which was placed following uncontrolled bleeding. The next step is
   a. observation
   b. proceed with laparoscopic ureteral reimplantation
   c. cystoscopy, examination for ureteral efflux, ureteral stent placement
   d. convert to open for a closer evaluation

3. A 57-year-old woman recently underwent an uncomplicated laparoscopic total abdominal hysterectomy and bilateral salpingo-oophorectomy for endometrial cancer. Postoperatively, she develops persistent leakage of fluid from the vagina and a fistula is suspected. A double dye (tampon) test is performed using oral phenazopyridine and methylene blue injected into the bladder. The tampon demonstrates proximal orange discoloration. The most likely source of her persistent leakage is
   a. vesicovaginal fistula
   b. ureterovaginal fistula
   c. vesicovaginal and ureterovaginal fistulas
   d. peritoneal fluid

4. A 42-year-old woman with a history of locally advanced cervical cancer is treated with chemoradiation. Approximately 2 years after treatment, she notes persistent leakage of blood-tinged fluid from the vagina and she has hematuria. At cystoscopy there is an erythematous and edematous focal area along the posterior bladder wall proximal to the trigone associated with an inflamed mass. The next step is
   a. administer antibiotics and repeat evaluation following treatment
   b. laser coagulate the bladder mass
   c. electrocoagulate the bladder mass
   d. transurethral biopsy of the bladder mass

5. In a patient with a history of pelvic radiation, the recommended waiting period following diagnosis for definitive fistula repair of a vesicovaginal fistula is
   a. 2 to 6 days
   b. 7 to 10 days
   c. 3 to 6 months
   d. 6 to 12 months