Urogenital Fistula

Micheline J. Wong, MD, Keri Wong, MD, Azadeh Rezvan, MD, Alison Tate, MD, Narender N. Bhatia, MD, and Tajnoos Yazdany, MD

Abstract: This review summarizes the available evidence in the literature on the etiology, diagnosis, management, and prevention of vesicovaginal, urethrovaginal, ureterovaginal, vesicocervical, and vesicouterine fistulae. Urogenital fistula is divided by origin: obstetric fistula occurring predominantly in developing countries and iatrogenic fistula, the most common cause in developed countries.

Key Words: urogenital fistula, vesicovaginal fistula, urethral vaginal fistula, ureterovaginal fistula, obstetric fistula, fistula repair, urinary tract injury

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The World Health Organization estimates that there are 130,000 new cases of urogenital fistula per year worldwide,[1] most commonly as a result of obstructed labor. However, because many women in developing countries never seek treatment, the true prevalence is unknown.[2] In developed countries, gynecologic surgery is the most common cause of fistula formation and is the focus of this review.

In this review, we present the available evidence in the literature on the etiology, diagnosis, management, and prevention of vesicovaginal, urethrovaginal, ureterovaginal, vesicocervical, and vesicouterine fistulae. The majority of the literature available is expert opinion, case series, and case reports (levels 2 or 3 evidence), with few comparative studies and randomized trials (level 1 evidence).

ETIOLOGIES

Obstetric Fistula

Generally, obstetric fistulae are a phenomenon of the developing world resulting from obstructed labor and inadequate obstetric care. Obstetric vesicovaginal fistula (VVF) is caused by direct pressure of the trapped fetus over a wide area of the pelvis for a prolonged period, resulting in tissue ischemia. A fistula forms after significant scarring, fibrosis, and widespread destruction of the vagina. The most common are VVFs and urethrovaginal fistulae.[3] Obstetric fistulae tend to be much larger than those of post–gynecologic surgical origin.

Although obstetric fistulae are rare in the developed world, they occasionally occur after operative deliveries. Bladder injury associated with uterine rupture at delivery,[4,5] forceps and vacuum-assisted vaginal deliveries,[6] and manual placental extraction[7] are reported causes of fistula. Vesicovaginal fistula and vesicouterine fistulae are reported to occur after bladder injury during repeat cesarean deliveries and peripartum hysterectomies.[8] Case reports also describe vesicocervical fistula[9] and VVF formation after McDonald cerclage.[10]

Iatrogenic Fistula

In developed countries, most cases of fistula are a result of surgical injury. Possible mechanisms of fistulae include direct injury during the dissection around the bladder, urethra, or ureter or improper placement of a clamp or other instruments. Unrecognized ureteral injury leads to extraperitoneal or intraperitoneal accumulation of urine, which leaks out of the vaginal cuff.[11] Sutures or other materials that are incorrectly placed can cause pressure necrosis, tissue loss, and fistula formation. Postsurgical fistulae tend to be small, isolated, and surrounded by healthy tissue.[8]

Unrecognized urinary tract injuries during abdominal surgery, especially total abdominal hysterectomy, occur in approximately 1 in 1300 surgeries. In the United States, 80% of VVFs are caused by benign gynecologic surgeries.[8] Although rare, fistulae have been reported after uterine perforation as a complication of hysteroscopy with dilation and curettage.[12]

Other risk factors for VVF include a history of pelvic irradiation, gynecologic malignancy, endometriosis, pelvic inflammatory disease, infection, trauma or foreign bodies, and history of previous pelvic surgery.[8,13]

Although fistula is not common after urogynecologic procedures, the incidence has increased with use of synthetic mesh and kits.[8] There are reports of urethrovaginal fistula and necrosis following retropubic midurethral sling,[14] VVF following transobturator midurethral sling,[15] and mesh-augmented anterior vaginal repair.[16] Periurethral collagen injection has also been reported to cause urethrovaginal fistula.[17] The incidence of urethrovaginal fistula following urethral diverticulectomy ranges from 0.9% to 5%.[18]

DIAGNOSIS AND WORKUP

Presentation and Symptoms

Diagnosis of genitourinary fistula requires a thorough medical history, physical examination, and a high level of suspicion. Timing of presentation and symptoms differ according to the etiology and location. Most urogenital fistulae present with leakage of urine from the vagina immediately following direct trauma to the lower urinary tract. However, fistulae resulting from hysterectomy or cesarean delivery often present 7 to 30 days from surgery. Trauma from clamps or suture can result in a cycle of devascularization, tissue necrosis, and the formation of a fistula tract over time. Fistula tracts following radiation therapy may present weeks or months from the last radiation treatment. Ureteric fistulae from transection of the ureter often have immediate postoperative complications such as fever, chills, and flank pain, but vaginal urinary leakage does not present until days or weeks later when the ureter has migrated and formed a tract with the vagina or skin.[19]

The location of the tract correlates with presenting symptoms. Vesicovaginal fistula, proximal urethrovaginal fistulae, and ureterovaginal fistula usually have constant vaginal leakage

From the Division of Female Pelvic Medicine and Reconstructive Surgery, Department of Obstetrics and Gynecology, Harbor-UCLA Medical Center, Torrance, CA.
Reprints: Micheline J. Wong, MD, or Tajnoos Yazdany, MD, 1000 W Carson St, Box 489, D3, Torrance, CA 90509.
E-mail: micheline.wong@gmail.com.
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of urine. Distal urethrovaginal fistulae, which are beyond the urethral sphincter, present with vaginal urinary leakage while or after voiding.[20] Vesicouterine fistulae present with a triad of symptoms: urinary continence, amenorrhea, and menouria (cyclic hematuria).[21] Other presenting complaints can include perineal irritation, vaginal fungal infections, and recurrent urinary tract infections.

Physical Examination

Perineal inspection often reveals skin irritation from the constant contact with urine. On speculum examination, urine is seen within the vaginal cavity, which might be coming from the cervical os, vaginal cuff, or the anterior vaginal wall, depending on the type of fistula present. Large, complex fistulae, such as those that occur following an obstructed labor course, are easily identified and palpated, but smaller tracts can appear as a dimple with surrounding inflammation or granulation tissue. When the fistula is thought to have occurred secondary to hysterectomy, the tract is located along the cuff or just anterior to the scar. Urethrovaginal fistulae are often hidden by vaginal rugae if small. In addition, a urine analysis and culture should be obtained, and infections treated.

Dye Test

The tampon dye test has been used for decades for VVF diagnosis with no published sensitivity. The bladder is backfilled with methylene blue, and the vagina is then packed with gauze or a tampon. The patient is allowed to ambulate for at least 20 minutes, and the gauze is removed. The presence of blue dye on the gauze indicates a VVF; however, the absence of dye does not completely rule out VVF and does not eliminate the presence of ureterovaginal fistula. Ureterovaginal fistula should always be excluded because up to 12% of patients with VVF will have an associated upper tract involvement.[22] The double-dye test is a modification of the dye test to differentiate VVFs and ureterovaginal fistulae. If no VVF is identified on dye test as previously described, the bladder is drained, and the patient is administered intravenous (IV) indigo carmine, and the tampon or gauze is placed in the vagina and removed after 10 minutes. Dye on the proximal tip suggests ureterovaginal fistula. A simplified technique was described in 1990, using oral phenazopyridine instead of IV indigo carmine. Oral pyridium is given, and once the urine turned orange, a tampon was placed in the vagina, the bladder is drained and then immediately backfilled with 300 mL of saline and methylene blue. After 5 minutes, the bladder is drained, and the tampon removed.[23] Orange staining at the proximal tip of the tampon is suggestive of ureterovaginal fistula, whereas blue staining in the mid or lower portion of the tampon is suggestive of VVF or proximal urethrovaginal fistula.

Cystoscopy

Cystourethroscopy is not always needed but helps to identify the fistula location within the bladder. In addition, assessment of the bladder should include looking for sequelae of the fistula, such as foreign bodies and stones. In instances where the vaginal orifice is difficult to pinpoint, retrograde filling of the bladder with methylene blue after cystoscopy may assist in location of the vaginal fistula.

Imaging

Although not necessary, imaging is useful in determining the size, location, complexity, and number of fistulae and aids in deciding the operative approach. Numerous imaging modalities are used, with no clear consensus on the best option.[24] Often, more than 1 technique is required to fully characterize the tract.[25]

Conventional imaging such as cystography and voiding cystourethrography are the first-line imaging studies for VVFs, vesicouterine fistulae, and urethrovaginal fistulae with opacification of the vagina or uterus and visualization of the tract.[26] Hysterography is useful in the diagnosis of vesicouterine fistulae.[27] Upper urinary tract fistulae are best imaged using intravenous pyelogram or retrograde ureterograms.[26,28] Unfortunately, because of the small, tortuous nature of many fistulae, conventional studies frequently fail to detect the fistula tract, and additional imaging may be needed.[29]

In the event that standard physical examination, office studies, and conventional imaging are unsuccessful in locating the fistula tract, newer modalities such as computed tomography (CT) and magnetic resonance imaging (MRI) have been helpful. Findings on CT, such as contrast material in the vagina, air in the bladder, and bladder wall thickening, are highly suggestive of pelvic fistula formation. Three-dimensional reconstruction can help to delineate the anatomic location in VVFs that are difficult to identify and treat, such as those with recurrence.[30] Helical CT scan has also been used to localize the fistula tract in patients for whom several other tests were inconclusive.[26] Magnetic resonance imaging is ideal for localizing and characterizing fistulae because of excellent soft tissue contrast and imaging in multiple planes.[31,32] As MRI technology advances, it will likely become the modality of choice for diagnosing fistula when conventional means fail. However, MRI is costly, requires IV contrast, and takes longer to complete.

Ultrasound has also been useful in diagnosis but has limited utility with the superiority of other imaging modalities. In a case report, transvaginal ultrasound visualized anechoic regions between the bladder, endometrial cavity, and communicating tracts between the posterior bladder and lower uterine segment.[33,34] In a series of 15 patients, ultrasound was 100% sensitive in diagnosing VVFs compared with intravenous pyelogram/cystogram (60%) or cystoscopy (93%).[35] Transabdominal ultrasound can help diagnose VVFs while instilling contrast into the bladder.

TREATMENT AND MANAGEMENT

Timing of Repair Obstetric Fistulae

In developing countries, VVFs identified within 72 hours of obstetric injury should be immediately repaired while the tissues are unscarred and pliable. Waaldijk[40] reported 91.8% success in 170 subjects who had a repair within 3 months of diagnosis and 95.2% in another series of 1716 who had a repair before 3 months after the first and 98.5% after the second attempt.[37] Generally, 5% of small VVFs may close with simple prolonged bladder drainage. In a review of 30 case studies, the success of spontaneous fistula closure with bladder drainage ranged from 0% to 100%. Catheter time, fistula size, and time since injury were variable.[38] In a series of 42 VVFs, closure with bladder drainage was successful in 3 subjects with defects of less than 1 cm.[39] In another study, VVFs that closed with bladder drainage alone were less than 4 mm,[36] and another had 50% to 60% spontaneous healing with fistulae of 2 cm or less.[40] During the "waiting period" while inflammation and granulation tissue resolve, small fistulae may spontaneously close with catheter drainage. However, VVFs larger than 1 cm should be repaired surgically because they most likely will not close with catheter drainage alone.

Although early repair is successful, the majority of patients in developing countries present months to years after the fistula formation,[41] and fibrosis and epithelialization have already occurred.

If a fistula is identified while the tissues are inflamed or -infected, a 3- to 6-month waiting period is recommended until edema, erythema, and granulation tissue have resolved. Perineal care and prevention of infections preoperatively are important. Anemia and malnutrition should be corrected to improve healing of the repair.

In developing countries, fistulae involving the uterus and/or cervix may not be recognized until long after the injury has occurred (usually bladder injury associated with cesarean or operative vaginal delivery). Surgical repair can be initiated as soon as the diagnosis is made. However, if noted immediately after delivery or within 6 weeks after delivery, catheterization of the bladder for 4 to 8 weeks may lead to spontaneous closure 5% of the time.[42] Large vesicouterine fistulae that are immediately symptomatic can be repaired as soon as they are diagnosed. However, repair should wait until suture and granulation tissue in the bladder have resolved. Before surgery, the bladder should be catheterized, and urinary tract infections treated.

Urethrovaginal fistulae resulting from obstetric injury are usually recognized early (within 10 days) because of incontinence-related symptoms. They should be repaired as soon as they are recognized.

Timing of Repair: Iatrogenic VVF

When identified early (before granulation tissue forms) after iatrogenic cystotomy, VVF can be repaired immediately. Otherwise, draining the bladder for 3 months allows suture and granulation tissue to be absorbed. In 2 case studies, post-hysterectomy VVFs repaired within 35 days of surgery had success rates of 91% and 100%.[43,44] Postmenopausal women should be given vaginal estrogen, to improve epithelial thickness and vascularity.[45,46] Continuous catheterization during the waiting period likely increases the risk of infection[47]; however, this has not been proven in comparative studies.

Level 1 evidence supports the use of antibiotic prophylaxis during fistula repair. A randomized trial comparing placebo with 500 mg of ampicillin intraoperatively did not show significantly improved repair failure or objective incontinence rates. However, the ampicillin group had fewer urinary tract infections 10 days after surgery.[48] Another study randomized 750 patients undergoing repair to receive a single dose of gentamicin at the time of anesthesia versus extended antibiotic treatment (IV amoxicillin, chloramphenicol, and trimethoprim and sulfamethoxazole at surgery then continued orally for 7 days). Compared with the extended treatment group, gentamicin group had better surgical outcomes, defined as no leakage or incontinence on discharge from hospital (94.5% vs 89.4%, $P = 0.04$). However, the authors concluded that the percentage difference was not statistically significant (5.1% [−0.4 to 10.61]) and that a single dose of gentamicin IV at the time of anesthesia is as effective as extended use of multiple antibiotics.[49] Perioperative antibiotics are recommended; however, various regimens may be equally effective in successful repair and reducing the need for postoperative antibiotics.

VAGINAL REPAIR OF VVF

Vaginal repair of VVF should be the preferred primary surgical route because of significantly less blood loss, operative time, decreased use of analgesics, and shorter hospital stays.[50] For a successful vaginal repair, candidates require adequate vaginal epithelium, minimal stenosis, adequate bladder capacity, and no involvement of ureters and other organs.

Latzko Technique

The Latzko technique involves a partial colpocleisis without excision of the fistula tract.[51] Visualization of the fistula opening is vital during surgical repair. A pediatric Foley catheter is placed through the fistula opening using the balloon for traction on the tissues during dissection. Stay sutures at the fistula margin keep orientation and can evert the fistula edges during repair. The vaginal epithelium dissection is developed using hydrodissection. The ureters should be catheterized if the fistula opening is close to the ureteral orifices or if there is question of their proximity or involvement.[8] A 1- to 2-cm margin of vaginal epithelium surrounding the fistula opening is sharply denuded and completed freed from surrounding tissues. An inverted U-shaped incision can help to maintain orientation. The fibromuscular layer is closed with tension-free imbricating layers using 3-0 delayed absorbable sutures. The muscularis layer of the vagina and vaginal epithelium is closed with 2-0 interrupted sutures to create a watertight repair (Fig. 1).

Compared with excising the tract, the Latzko technique avoids widening of the fistulous tract, bleeding associated with excising the tract, tissue necrosis related to cautery of this bleeding, and injury to the ureter if close to the repair site. In addition, leaving the fibrous tissue lining of the tract may provide support for the repair. Fistulae less than 3 cm can be closed successfully by partial colpocleisis.[52] Reported success of the Latzko repair is between 93% and 100% for primary and repeat repairs without significant problems with vaginal shortening.[53] In a series of 10 patients with VVF repaired by the Latzko technique, none had sexual dysfunction or shortened vaginal length.[54]

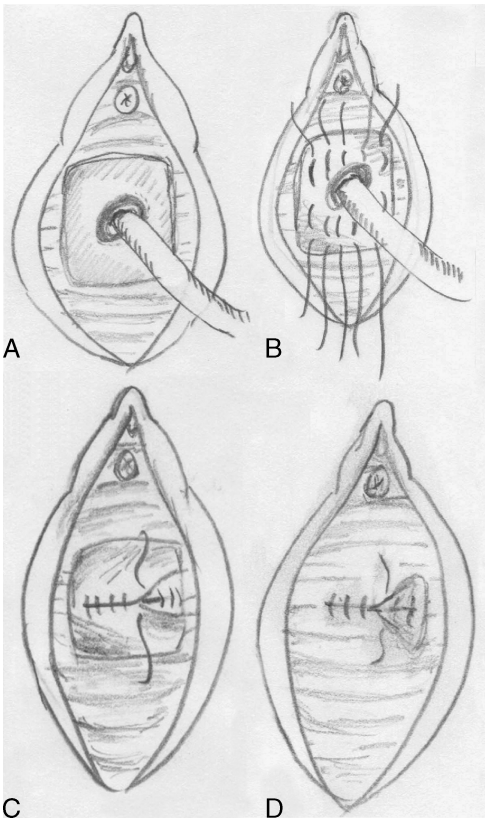

FIGURE 1. Latzko VVF repair. A, A 1- to 2-cm margin of vaginal epithelium is sharply denuded, leaving the fistula tract intact. A pediatric Foley catheter helps to create traction on the tissues. B, The first layer of imbricating interrupted sutures to close the fibromuscular tissue. C, Closure of the musclaris layer of the vagina with interrupted suture. D, Closure of the vaginal epithelium.

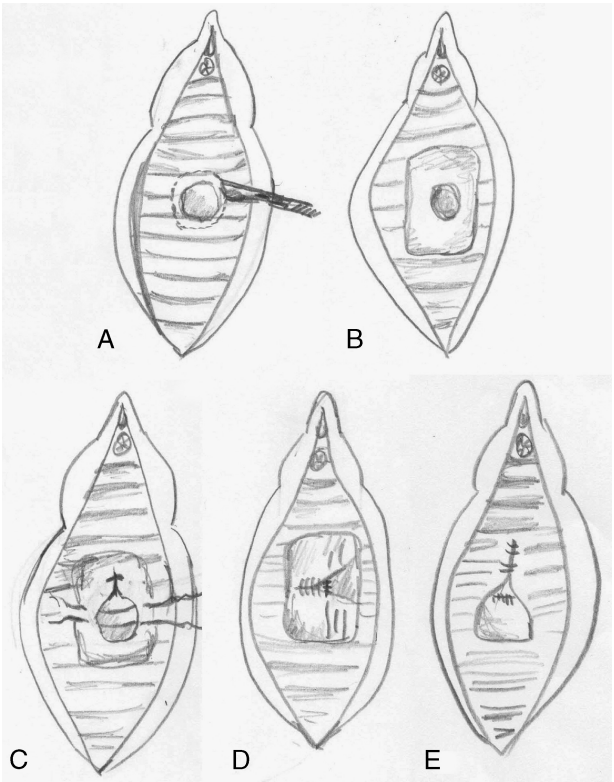

FIGURE 2. Layered closure of VVF. A, The fistula tract is sharply excised. B, A 1- to 2-cm margin of vaginal epithelium is sharply denuded. C, The bladder defect is closed with interrupted sutures. D, The endopelvic fascia closed with interrupted sutures in the opposite direction to avoid overlapping suture lines. E, Closure of the vaginal epithelium.

Layered Closure

A layered closure is necessary for more distal and complex fistulae. Surrounding tissues are thoroughly mobilized, minimizing tension, and the fistulous tract is excised. Avoid excising excessive amounts of the fistula edges to prevent hemorrhage of the bladder edges and further decreasing the bladder volume. The bladder defect is closed in 1 or 2 layers with 3-0 absorbable interrupted sutures in a transverse fashion near the trigone to prevent kinking of the ureters. The endopelvic fascia and vagina are closed over the bladder using 2-0 absorbable sutures. Alternating horizontal and vertical suture lines prevent the suture layers from lying directly beneath one another (Fig. 2). Methylene blue or sterile milk is instilled into the bladder to test the integrity of the repair for watertightness.[8]

Use of various types of suture is described; however, there are no comparative studies recommending 1 suture type over the other. Permanent suture in the bladder may cause calculi and should be avoided.[55,56] Delayed absorbable sutures such as polyglactin are desirable because of their strength in maintaining a watertight closure.

Martius Flap

Utilization of a tissue flap may be necessary in cases of large, fibrotic, or necrotic fistulae, involving the urethra or when there is inadequate vaginal tissue. The most commonly used vaginal flap is the Martius, a transposition of a labial fat pad with or without the bulbocavernosus muscle. The blood supply comes from the perineal branch of the internal and external pudendal arteries.[57] A 6 × 2- to 8 × 3-cm labia majora fat pad is mobilized and left intact on one end. After mobilization of the vaginal epithelium, the fat pad is passed medially under the labia minora, attached to cover the fistula opening, and closed without tension (Fig. 3). Success of the Martius flap is 70% to 100%.[58] However, in 2 case series, repair with and without Martius graft was not significantly different.[11,59] Other flaps and reinforcement reported are gluteal fat pads, collagen xenograft,[60] oxidized cellulose,[61] and the cervical lip for juxtacervical VVF closure.[62]

ABDOMINAL REPAIR OF VVF

Abdominal repair of VVF may be necessary if the fistula is high in the vagina and/or associated with fibrosis and stenosis. Abdominal repair is also beneficial with ureteral, uterine, or bowel involvement and allows for omental flap, myocutaneous flap, bladder augmentation, and ureteral reimplantation. A sagittal cystotomy is made in the dome of the bladder, and ureteral stents are placed if the fistula opening is near the ureteral orifice. The fistulous tract is excised, and the vaginal tissue is separated from the bladder using sharp dissection. Placing a pack or lap sponge to elevate the vagina provides countertraction. The vagina is closed using 2-0 interrupted absorbable sutures, and the bladder is closed in 2 layers using 3-0 interrupted absorbable sutures (Fig. 4). An omental or peritoneal flap is attached between the anterior vaginal wall and posterior bladder to separate the suture lines.[8] With the O'Conor and Sokol[63] technique, the bladder is completely bivalved to the fistula opening.

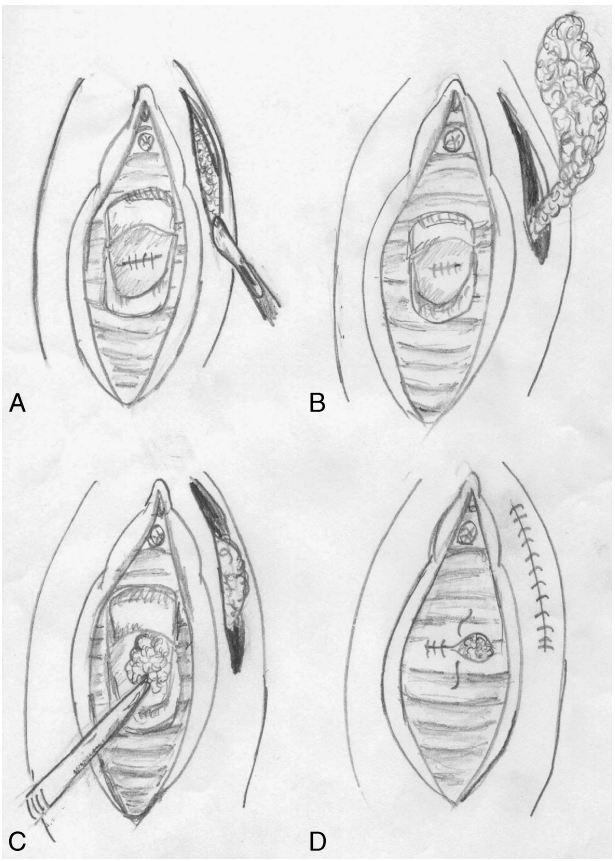

FIGURE 3. Martius flap. A, Incision in the labia majora. B, The labial fat pad is dissected, leaving one end intact. C, The fat pad is passed medially to cover the repaired VVF. D, The vaginal epithelium is closed over the labial fat pad.

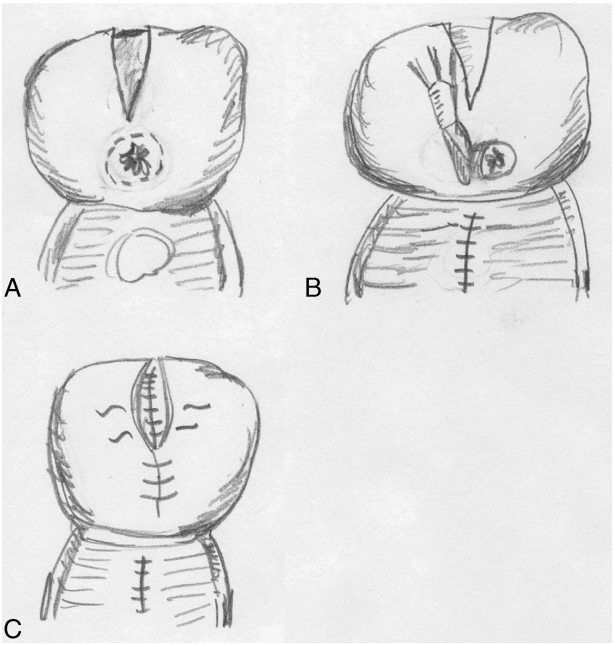

FIGURE 4. Abdominal repair of VVF. A, A Sagittal cystotomy is made, and the bladder and vagina are dissected apart. B, The fistula tract is excised. The vagina is closed. C, The bladder is closed in 2 layers.

MINIMALLY INVASIVE REPAIR OF VVF

Nezhat et al[64] reported the first laparoscopic VVF repair. Laparoscopic repair has less blood loss, postoperative pain, hospital stay, and infection and faster recovery than abdominal surgery.[65,66] The peritoneum over the bladder is opened sagittally after the bladder is back-filled. The bladder is bivalved using a laparoscopic O'Conor and Sokol technique, or the vagina is dissected from the bladder without cystotomy. The fibrous tissue and fistulous tract are excised. The vagina and bladder are closed separately in 2 layers. An omental interposition or peritoneal flap is placed between the incisions then sutured into place.[67] Case studies report success of 86% to 92%, with 7.7% to 12% conversion to laparotomy.[68–70] Laparoscopy allows for ureteroneocystostomy and psoas hitch for the treatment of posthysterectomy ureterovaginal fistula with 100% success in 19 subjects at 3 and 12 months.[71] Laparoscopic repair has advantages over abdominal repair; however, it requires surgeon skill, equipment, general anesthesia, and possibly more operating time. In addition, there are no comparative studies to prove that success and benefits of repair are greater compared with traditional vaginal and abdominal repairs.

There are case reports of robotic-assisted repair of VVF, but the advantages are not proven in the literature. One case series of 5 robotic VVF repairs reported a success of 100% with 6 months' follow-up.[72] In a comparative series of 12 robotic repairs for recurrent VVFs matched to 20 open abdominal repairs, success rates were similar (100% vs 90%, $P > 0.05$). Operative time and complication rates were similar; however, blood loss and hospital stay were significantly less.[73]

Minimally invasive nonsurgical treatments are advantageous because anesthesia is not required. Older techniques include curettage of the fistulous tract, using an ordinary screw, followed by catheterization.[74] Newer minimally invasive techniques have been recently described in comparative studies and may lead to support of their use. In a multicenter trial, 38 subjects were nonrandomly assigned to receive fibrin glue to close the fistula via a cystoscope versus Martius flap. At 3 months, success was not significantly different (68% vs 58%).[75] In 1 case report, bovine collagen was successfully injected, transurethrally, into the bladder mucosa and vagina, surrounding the fulgurated fistulous tract and filled with fibrin glue.[76] Cyanoacrylic glue has been used via a cystoscope with 85% success after a mean of 35 months' follow-up.[77]

POSTOPERATIVE CARE

Following VVF repair, the bladder should be continuously drained for at least 10 days and up to 6 weeks. Some advocate suprapubic catheters to reduce bladder spasm, infection, and patient discomfort, but there is no evidence to support this. Pelvic rest should be observed, and pelvic examination and intercourse should be deferred until all suture lines are completely healed (usually 4–6 weeks).

Repair of Vesicouterine and Vesicocervical Fistula

Repair of vesicouterine or vesicocervical fistula is similar to VVF repair. A cystotomy is made, the bladder is sharply dissected off the uterus, and the fistulous tract is excised. The bladder is closed in 2 layers followed by closure of the uterus using interrupted absorbable sutures with an omental flap placed between the bladder and uterus. Hysterectomy is a definitive treatment for vesicouterine fistula for patients not desiring future fertility.

Repair of Urethrovaginal Fistula

Urethrovaginal fistula repair is similar to VVF repair using tension-free suture layers with or without interposition of a labial fat pad. A suburethral fascial sling may be placed if the fistula is in the proximal urethra or bladder neck with a vascular fat pad attached in between. Complete urethral mobilization with dissection extending laterally to the pubic ramus bilaterally is necessary to allow for a tension-free closure. After the fistulous tract is excised, interrupted sutures are placed, avoiding the urethral mucosa in 2 layers. In the complete absence of the urethra, use of a vaginal flap or mobilization of the anterior bladder wall from the space of Retzius provides tissue for neourethral construction with 90% success.[78]

REPAIR OF URETEROVAGINAL FISTULA

Once ureterovaginal fistula is identified, the ureters should be stented and left in place for 6 to 8 weeks. Between 10% and 80% of ureterovaginal fistulae will close with stenting alone. Ureterovaginal fistulae not closed after 6 to 8 weeks must be repaired abdominally. Injury or fistula involving the distal one third (distal 4–5 cm) of the ureter is treated by ureteroneocystostomy (ureteral reimplantation into the bladder). A psoas hitch may be necessary to maintain the anatomic position of the bladder and reduce tension of the ureter and bladder. A fistula involving the middle and upper third of the ureter must be repaired by resecting the involved area and reanastomosing the 2 ends of the ureter (ureteroureterostomy). This is usually done over ureteral stents. The retroperitoneum should be drained with a Jackson-Pratt or Blake drain postoperatively.

SUCCESS OF VVF REPAIR

Success Rates

There are hundreds of case series from 4 to more than 1000, with a mean success of 90%, ranging from 40% to 100%.

However, authors often do not define success, and many consider surgical closure successful if the patient is discharged from the hospital without leakage after removal of the catheter. When factoring incontinence, long-term follow-up, and the number of patients lost to follow-up, success rates decrease by as much as 15% to 30%. In a study of 90 patients treated for fistula, 85% had a successful closure; however, if residual incontinence and patients lost to follow-up were considered failures, the success rate was 41%.[79]

Factors Determining Success

Larger or circumferential fistulae, scarring, and urethral involvement have a higher risk for primary failure.[80] In a case series of 197 patients, the success rate was 50% for fistulae of 4 cm or greater compared with 92% with fistulae of 1 to 2 cm.[81] Fistulae without fibrosis have 100% successful closure compared with 16.7% with marked fibrosis.[82] Nonradiated fistulae have success rates between 70% and 100%; however, for radiated fistulae, success rates are 40% to 100%.[83] In a series of 505 obstetric fistulae, there was significant improvement in multiparous compared with prima gravida subjects.[84] The number of previous attempts, patient's health status, availability of health facilities, and surgeon's experience all have an impact on successful repair.[85]

Most experts suggest that good surgical technique such as mobilization of tissues and tension-free closure is a vital component of a successful closure. There are no comparative studies investigating success between surgical techniques; however, in a case series of 1045 VVF repairs, 1- versus 2-layer vaginal closure had similar success (91% vs 93%) when controlled for fistula size.[86] In multiple retrospective cohort studies, abdominal and vaginal repair success was 75% to 100% without significant difference between routes.[87] However, using an omental interposition had a higher success than peritoneal interposition (94% vs 37.5%, $P = 0.002$).[88] Treatment success of fistula repair is generally high; however, there is no level 1 evidence recommending 1 method over others.

PREVENTION

In developing countries, fistula prevention should be directed toward improving obstetric care. Some have advocated educating the traditional birth attendants to identify obstructed labor, public policy addressing early marriage and female circumcision, providing inexpensive transportation for emergencies, hostels for women during pregnancy near hospitals, and funding local hospitals offering free or inexpensive obstetric care. Recommendations for prevention of obstetric fistulae include extended Foley catheter use in women with labor for more than 24 hours to allow better bladder healing if injury exists.[89]

In developed countries, because urogenital fistulae most often result from urinary tract injury during hysterectomy for benign disease, early detection and adequate repair of injury are important in preventing fistula. In an animal study, laparoscopic hysterectomy followed by monopolar electrosurgical cystotomy was performed on 24 dogs. A simple 1-layer closure versus excision of the fistula and 2-layer closure versus 2-layer closure and omental flap were compared. After 27 days, there were 2 VVFs in the single-layer-closure group.[90] Based on this animal model, 2-layer closure of cystotomy may prevent fistula.

Detection of urinary tract injury at the time of surgery is important for preventing urogenital fistula. In a meta-analysis, only 11.5% ureteral and 51.6% bladder injuries were detected intraoperatively. With routine cystoscopy, detection increased to 90% ureteral and 85% bladder injuries.[91] Early detection of urinary tract injury at the time of primary surgery allows for immediate repair and less fistula development.

Avoiding risk factors of VVF helps in prevention. Patients who develop VVF have greater tobacco use, longer operative times, larger uterine size, bladder injuries extending into the trigone, and surgical blood loss of greater than 1000 mL.[92] Smoking cessation before surgery, longer Foley catheter use, and reinforced repairs such as omental flap or 2-layer closures in longer or more challenging cases may all decrease the risk of urogenital fistula.

CONCLUSIONS

Evidence supporting fistula management continues to be based on levels 2 and 3 evidence. Authors agree that improved research and comparative studies in the area of fistula care are warranted. However, the incidence of urogenital fistula worldwide remains constant, and recommendations for management have not drastically changed over the past 50 years. Current repair techniques are successful and should continue to be utilized on an individualized basis.

Urogenital fistulae encountered in developing countries usually result from obstructed labor due to poor obstetric care. They tend to be large and associated with fibrosis and compromised surrounding tissues requiring a complicated repair. Prevention lies in improvement of obstetric services in developing countries.

In developed countries where urogenital fistulas most often result from urinary tract injury during gynecologic surgery, surgeons can prevent fistula formation by using careful dissection and surgical techniques. Especially after hysterectomy, urinary tract integrity should be assessed before leaving the operating room. Success in management is dependent on patient and fistula characteristics as well as surgeon experience.

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UROGENITAL FISTULA QUESTIONS

1. What percentage of patients with vesicovaginal fistula also have ureterovaginal fistula?
   a. 2%
   b. 12%
   c. 20%
   d. 52%

2. What is the incidence of urogential fistula after abdominal surgery?
   a. 1 in 130 (0.8%)
   b. 1 in 230 (0.4%)
   c. 1 in 1,300 (0.08%)
   d. 1 in 2,300 (0.04%)

3. Which statement regarding perioperative antibiotics for fistula repair is correct?
   a. Compared with placebo, intraoperative 500 mg of ampicillin improves failure and continence rates.
   b. The risk of postoperative urinary tract infection is lower in patients receiving intraoperative ampicillin compared with placebo.
   c. Patients given combined extended antibiotic regimens have significantly higher fistula closure rates than a single intraoperative dose of gentamicin.
   d. A single dose of gentamicin is more effective than multidose regimens for infection prophylaxis in fistula repair.

4. Which of the following statements about fistula repair is correct?
   a. Transurethral fibrin glue injection for fistula closure is not as effective as surgical repair with a Martius flap.
   b. The Latzko colpocleisis does not shorten vaginal length and cause sexual dysfunction.
   c. During laparoscopic repair of urogenital fistulae, the reported conversion rate to laparotomy is 21% to 27%.