Vaginal Fistula Repairs

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Introduction

A urinary fistula is defined by extra-anatomic communication between two contiguous organs. This communication in the lower urinary tract may involve the ureters, bladder, or urethra, which makes an abnormal connection with the rectum, vagina, uterus, or skin. A complex urinary fistula might involve several different abdominal and pelvic organs, emphasizing the importance of a complete workup before attempting a repair.

A urinary fistula negatively affects an individual's quality of life, and prompt repair is suitable in most patients that are properly selected. There are many surgical approaches to repair a urinary fistula. The best repair centers on the first procedure being the most effective. However, there is a lack of high-quality comparative studies to guide the surgeon. When selecting the initial surgical approach, the surgeon should consider their expertise and experience after a thorough evaluation to determine the etiology and location of the fistula. In this chapter, we will focus on the etiology, diagnosis, evaluation, and surgical repair of vesicovaginal, urethrovaginal, ureterovaginal, and rectovaginal fistula.

General Principles of Fistula Repair

This chapter provides an overview of the principles for successful repair including the evaluation, timing, condition of the patient, vaginal access, surgical approach, and use of adjuvant procedures. The majority of fistulas encountered in developed countries are iatrogenic and will be the focus of this chapter.

Evaluation

History and Physical Examination

Women with vesicovaginal fistula (VVF) and urethrovaginal fistula most often present with constant urinary incontinence shortly after a pelvic surgery. Questioning about the degree of difference voided and the amount leaked may give clues to the size and location of the VVF. If leakage is small volume and continuous, a small fistula may be anticipated. If minimal voiding occurs, a larger fistula should be suspected. Timing of the onset of leakage and whether there is stress incontinence or urge incontinence with overactive bladder symptoms before the VVF is important to consider in selecting treatment options and patient counseling. A patient with a

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urethrovaginal fistula in the distal third of the urethra may remain continent and asymptomatic or they will commonly describe a splayed urinary stream. They may additionally complain of urinary leakage after vaginal voiding. When the fistula is in the mid-urethra and part of the external sphincter, the patient may have positional intermittent leakage of urine. Patients may have constant, large amounts of urine leaking indicating there is a large fistula that is located proximal to the mid-urethra in the proximal urethra or bladder neck. Gathering information to determine the etiology and prior surgical attempts to repair the fistula can affect the treatment plan.

On physical examination, there should be careful inspection of the fistula size, location, and quality of the surrounding tissue. The location of VVF after hysterectomy is usually a single fistula at the vaginal cuff, although it may present as a complex VVF with multiple fistulas. Evidence of the fistula site is found with surrounding inflammation with granulation and tissue defect. Adequate vaginal access and the degree of mobility of the tissue surrounding the fistula are revealed by the amount of vaginal prolapse. Nulliparous patients or with a history of radiation may be challenging due to a lack of vaginal access and mobility because of narrow vaginal width. On examination, the integrity of the vaginal epithelium, urethral mobility, and assessment of stress incontinence with provocative maneuvers should be performed.

It is important to differentiate the origin of the vaginal drainage and not to make any assumptions as the fluid may be from the fallopian tube, vaginal secretions, peritoneum, lymph, or urine. The differential diagnosis of VVF is urethrovaginal fistula, ureterovaginal fistula, uterovaginal fistula, ectopic ureter, or vaginal infection. The presenting symptoms may be recurrent urinary tract infections with chronic perineal changes exhibited by poor healing and irritated skin. A complete vaginal examination will guide the surgeon to the diagnosis, but this may be indeterminate and other tests may be needed to make the diagnosis.

Patients with rectovaginal fistula (RVF) often present with clinical symptoms of gas, stool, and purulent vaginal discharge. The physician should be aware that colonic or enteric fistula may present with similar symptoms as a rectovaginal fistula. History should focus on causes of the fistula, most commonly obstetric trauma, but also includes pelvic surgery, malignancy, history of radiation, pelvic abscess, and inflammatory bowel diseases. Occasionally, small or intersphincteric rectal vaginal fistula may be asymptomatic. Vaginal and bimanual examination should be performed taking note of the location, number, tissue quality, and size of the fistula. On examination, the fistula is normally clearly visualized, and instilling dye into the rectum may be of assistance. The location of the fistula is important in deciding the operative approach and is classified into high and low in relation to the anal sphincter. High fistula may need to be approached abdominally and low fistula transvaginally. Occasionally examination under anesthesia is indicated for a more thorough evaluation. During physical examination, anal sphincter tone should be evaluated, as this may need concomitant repair.

Diagnosis

The diagnosis of a urinary or rectovaginal fistula can most often be made upon a vaginal examination. A urethral catheter with retrograde filling of the bladder or rectum with dye may demonstrate the fistula on examination. A urinary fistula can be confirmed after administering phenazopyridine once it is excreted in the urine. By placing gauze or a tampon in the vagina, the gauze should turn orange in color in the presence of a fistula. A double-dye tampon test can further delineate the origin and location of the fistula by giving the patient phenazopyridine followed by retrograde instillation of dye, methylene blue, or indigo carmine, into the bladder through a catheter. A ureterovaginal fistula should be orange in the proximal part of the packing while a VVF or urethrovaginal should be blue in the mid or distal packing. A negative tampon test does not rule out a fistula and clinical suspicion is often required to make the diagnosis.

There are varying opinions and no consensus on the imaging required in the evaluation of a

VVF or urethrovaginal fistula. Many patients have a complex history with postoperative complications and there are medico-legal implications that should be considered [1]. Our practice is to completely evaluate the patient to attempt to address all problems at the initial repair. A voiding cystogram during filling may demonstrate the fistula; however, the intradetrusor pressure may need to be increased during voiding to visualize small fistulas with the patient positioned in the lateral and oblique position. The lateral views may best demonstrate the fistula when it has a direct connection between the bladder and vagina or when the connection is indirect and enters a collection/sinus tract before draining into the vagina. The VCUG can identify additional findings of a urethrovaginal fistula which can be found concomitantly with VVF, the degree of vaginal prolapse, and stress incontinence [2]. Demonstration of preoperative stress incontinence may change the treatment plan by the addition of an anti-incontinence procedure or it may alter patient expectations so it will not be a surprise if they leak postoperatively. Upper tract involvement should be evaluated for obstruction or fistula.

While retrograde studies were in the past most important to rule out concomitant ureteric fistula, CT urogram with 3-dimensional reconstruction can demonstrate the integrity of the ureters. Cystoscopically, 0- or 15-degree lenses are used for visualizing urethral fistulas and finger compression of the bladder neck helps to fill the urethra. It is our routine practice to perform a cystoscopy to evaluate for a urethral fistula and consider it mandatory when there is a history of hematuria or radiation. Cystoscopy is different from urethroscopy. A urethroscopy should be performed with a short-beaked rigid cystoscope (urethroscope or hysteroscope) or flexible cystoscope to allow full visualization of the urethra. The light and the irrigant are at the same level allowing direct vision and expansion of the urethral wall. A 30- and 70-degree optic lens allow identification of bladder or urethral foreign bodies or lesions that would need to be biopsied. The fistula size and location in relation to the bladder neck, trigone, and ureteric orifice are determined on cystoscopy. If the fistula involves the bladder neck, it should be discussed with the patient, as it may affect continence after repair. Findings on a cystoscopy can determine if ureteral stents are necessary and if a combined vaginal and abdominal approach is appropriate when there is ureteric involvement.

It is important to document preoperative sexual function and discuss potential postoperative complications. Vaginal stenosis is a potential complication that can be corrected with a subsequent vaginoplasty in most cases. Vaginal shortening may result when a Martius flap has insufficient length for a proximal fistula or as a result of Latzko partial colpocleisis. The peritoneal flap is better situated for proximal fistula repair to prevent vaginal shortening. Patients should be counseled and encouraged that sexual function may improve following fistula repair [3].

Upper tract evaluation to assess for abnormal findings of hydronephrosis or urinary extravasation with CT urogram should be performed, although there are no formal recommendations to guide the surgeon. There is a 12% risk of upper tract injury with VVF [4]. Should there be further questions regarding ureteric involvement, a retrograde pyelogram would be justified, as it is the most sensitive in the detection of upper tract injury, although a CT urogram with reconstructions may be adequate in our experience [5]. Urine cytology is recommended for those with a history of malignancy or pelvic radiation.

Further radiologic evaluation with a CT of the abdomen and pelvis should be performed in cases of prior malignancy or in patients without other risk factors for RVF. Gastrografin enema may identify the location of the rectovaginal fistula. Proctosigmoidoscopy and colonoscopy may establish the diagnosis and evaluate for malignancy, especially in the case of radiation-induced fistula where about a third are malignant [6]. If there is any concern for malignancy, the fistula should be biopsied.

Anal sphincter tone should be evaluated preoperatively with physical examination. Nearly 50% of patients have fecal incontinence which should be discussed and potentially treated

simultaneously with fistula repair [7]. Our practice is to routinely obtain endoanal ultrasound when the cause of the fistula is from trauma after vaginal delivery. Endoanal ultrasound and anal manometry testing can provide valuable information regarding sphincteric function and defects preoperatively.

Timing

Timing of repair begins with an assessment of risk factors for poor healing (malnutrition, radiation, immunosuppression, or vaginal atrophy) that should be corrected when possible before proceeding with repair. The timing of repair depends mostly on the etiology of the fistula and the experience and comfort level of the surgeon. The surgical approach is individualized for every patient and depends on the experience of the surgeon. The first repair should be the most successful. Most fistulas are found after the acute period and traditionally it was thought that a period of about 6 months was required for tissue swelling and infection to resolve so that an optimal repair could be performed. However, we now know that there are similar outcomes with early or delayed repair with several reports where fistula repair can be performed successfully after 2 weeks [8–10]. The prerequisites for early repair are no obvious infection and the absence of an ischemic fistula from radiation or obstructed labor which can impede healing from the viability of tissue margins that vary with time.

In the cases of radiation-induced fistula, it is advisable to allow for tissue stabilization, although many fistulas present late when there is no active progression. Assuming there is no infection and the tissue has stabilized, the patient could proceed to surgical reconstruction. Radiation results in extensive tissue ischemia and the reported failure rates can be up to nearly 50% [11]. Due to high failure rates, adjuvant procedures involving tissue interposition should be performed. Consideration of temporary fecal diversion or in severe cases permanent urinary or fecal diversion may be warranted. Additional findings of diminished bladder capacity are common with the fistula typically located in the immobile region of the bladder trigone and may involve the ureteric orifices requiring an abdominal approach to perform bladder augmentation and/or ureteral reimplant.

Special consideration should be given to RVF from Crohn's disease by first contemplating medical therapy before proceeding to surgical repair. Medical therapy with anti-tumor necrosis factor therapy has a reported success rate of 60% at 1 year, but this declines to 36% at long-term follow-up with similar unsatisfactory results from other studies [12–16]. Other medical treatments include 6-mercaptopurine, and cyclosporine with limited success. Even with advances in medical therapy, surgical repair is the primary basis for long-term cure.

Abdominal or Vaginal approach

The goal of surgical repair is to have a durable repair with the least morbidity and to preserve continence. In deciding the surgical procedure, consideration is made to the location of the fistula, size, etiology, quality of the surrounding tissue, and vaginal access all of which could limit or change aspects of the surgery. Principles of repair regardless of approach include non-overlapping sutures, tension-free approximation of tissue, avoid devitalizing of the tissue, removal of foreign bodies, good hemostasis of the surgical field, a watertight, multilayer closure with or without the interposition of tissue, and postoperative bladder and urethra drainage or fecal diversion. An infratrigonal VVF is typically approached vaginally. While a supratrigonal fistula may be considered difficult to approach vaginally by some surgeons, in our experience, the non-irradiated high fistula that is not complex can be repaired by the vaginal approach. Other options include the abdominal approaches (open, laparoscopic, or robotic) [17–19]. An indication for an open or minimally invasive abdominal is based on surgeon preference or when there is a need for concomitant bladder augmentation, ureteral reimplant, intraperitoneal pathology, or bowel diversion.

Both abdominal and vaginal repair of VVF are well established and have excellent success rates with each approach having its advantages [20]. Laparoscopic and robotic repairs are being used more routinely at centers of excellence with encouraging results, but further study may be

warranted before wide-scale adoption [18, 19, 21–23]. There are some data to suggest shorter hospital stay and reduced morbidity in patients treated with a minimally invasive compared to open abdominal approach [18]. There are currently no studies directly comparing the vaginal approach to a minimally invasive abdominal approach. The advantages of a vaginal approach over open abdominal approach are decreased morbidity, shorter hospitalization, and decreased complications due to avoidance of intraperitoneal injury and a large bladder incision. In deciding the approach, a surgeon has to consider their experience, comfort, and familiarity with each approach. The first repair is the most important in establishing long-term successful outcomes from either approach.

Urethrovaginal fistula repair is tailored by the location, size, and symptoms. A fistula located in the distal urethra may only need an incision of the distal urethra or observation if asymptomatic. If the fistula is large in size (>1–2 cm), radiation induced, or tissue is necrotic and inflamed, the use of an interpositional tissue flap is recommended. Interposition with a Martius flap is the preferred method due to the location to the urethra and ease in dissection with minimal complications. More complex urethral damage may require more complex procedures like rotational vaginal or labial flaps, neo-urethral reconstruction, autologous fascia sling, or bladder neck reconstruction.

As in other fistula, there are no formal guidelines for rectovaginal fistula repair. Most urologists or gynecologists repair RVF vaginally, while colorectal surgeons are more familiar with transanal or abdominal repair. Most rectovaginal fistulae are easily accessed by the vaginal route, while the abdominal approach is used for sigmoid colon and proximal rectal fistulae. There is limited experience with minimally invasive treatment with fibrin glue or endoscopic management [24]. We will focus on vaginal repair, which avoids the morbidity of an abdominal surgery.

Before embarking on vaginal repair, there should be consideration to the fistula location, sphincteric function, quality of the tissues due to radiation or prior surgeries, concomitant abdominal pathology or the need for a diverting colostomy. A high fistula is not an absolute indication for an abdominal repair. A vaginal approach allows for simultaneous anal sphincter reconstruction. The surgeon's expertise and familiarity should be considered for each case.

Concomitant Procedures

Stress incontinence after successful VVF repair may cause distress and lead the patient to believe their surgery was a failure. Preoperative evaluation and education is important so patients understand their surgical options. Concomitant anti-incontinence procedures can be performed with fistula repair and do not increase the risk of recurrence, although it may be better to stage the anti-incontinence procedures [25]. In select instances, we would consider placement of a fascial sling at the time of VVF repair, but in the majority of cases, the procedure is staged because even temporary outlet obstruction can lead to fistula recurrence. A synthetic sling is not recommended, as it is a foreign body and may lead to fistula recurrence. Our preference is to stage an anti-incontinence procedure to prevent the risk of high-pressure voiding that may result in fistula recurrence.

The approach is similar with urethrovaginal fistula, in which the majority of cases the procedure is staged to prevent the development of urethral obstruction and increased risk of fistula recurrence. The condition where there is less controversy about placing a fascial sling is when the fistula involves the mid-urethra sphincteric complex or distal third of urethra and there is suspicion that the patient will be incontinent postoperatively. The sling would be placed proximal to the repair at the bladder neck. Some have successfully reported concomitant autologous fascial sling at the time of a fistula repair, while we have not placed a sling distal to our urethral repair due to the risk of the sling creating obstruction and high-pressure voiding that may result in fistula recurrence.

Ureteral Reimplant and Bladder Augmentation

Diagnostic evaluation can determine the need for additional bladder or ureteral surgery which would require an abdominal approach. An

abdominal approach is indicated when there is ureteric obstruction or fistula which would require reimplantation. Placement of preoperative ureteral stents when a vesicovaginal fistula is located near the ureteric orifice may avoid reimplant. In cases of a small and contracted bladder capacity, an augmentation should be performed. The need for concomitant procedures can typically be assessed with urodynamic studies that assess bladder capacity and compliance.

Fecal Diversion

The decision to perform a temporary diverting colostomy or ileostomy is made on an individual basis, as there are no absolute indications. The surgeon may elect to divert stool with complex fistula that are radiation induced, recurrent, large, or a result of malignancy. The diversion is taken down 3–6 months postoperatively after a successful repair.

Tissue Interposition: Peritoneal, Martius, Labial, Gluteal Flaps (Inner Thigh Rotational Flaps Based on the Internal Pudendal Artery)

Urinary repair and reconstruction is complex and requires many techniques to be in the surgeon's armamentarium. Successful repair consists of several layers in the closure of the fistula. The use of interpositional tissue is advised when the fistula is complex, large, a history of radiation, tissue is inflamed, or closure is suboptimal. There are differing opinions when tissue interposition is necessary, as there are no definitive indications. Evan et al. in a retrospective study showed improved success rates of VVF repair with interpositional flap [26]. There are several described flaps that can be used for interposition. After a hysterectomy, the location of the VVF is often at the vaginal cuff and we routinely use a peritoneal flap due to its ideal location, ease of dissection, and it maintains a reliable vascular supply. The results have been excellent with a peritoneal flap with 96% success rate [17]. A peritoneal flap is an appropriate choice for supratrigonal fistula and in the case of a distal fistula, it should be repaired with a Martius flap due to its location. Successful repair has been reported at 97% with a Martius flap [17]. The Martius flap is well vascularized with the blood supply superiorly by the external pudendal artery, laterally by the obturator artery, and inferiorly by the posterior labial branches of the internal pudendal artery by which it is usually based. The Martius flap is mobilized by transection of the superior and lateral pedicles and its blood supply is based on the inferior pedicle in the majority of cases. Successful repair is subject to adequate mobilization so that the flap is off tension without compromising its blood supply. Disadvantages are that it may not reach a proximal fistula without compromising its viability or resulting in vaginal shortening [17].

Rotational labial and inner thigh rotational flaps are selected for specific conditions – large vaginal defects, difficult vaginal access requiring a relaxing incision subsequent need for vaginal coverage, large, recurrent, or radiation-induced fistula. When there is a large vaginal defect, these flaps can provide fibroadipose tissue and skin coverage with a well-vascularized blood supply. Full-thickness rotational labial flaps for anterior vaginal wall or gluteal flaps for posterior or proximal vaginal wall are chosen depending on the location of where the flap is needed. A full-thickness rotational labial flap is the same fatty tissue of a Martius flap with its overlying skin that is rotated to cover an anterior vaginal defect. The fistula is first repaired and then a U-shaped incision is made lateral to the labia majora with the apex located at the posterior fourchette. The flap's blood supply is from the superior pedicle which is based on the external pudendal artery. This flap is dissected free from the fascia of the pubic bone so that it can be rotated medially to achieve repair. In a small series, there has been a successful report of this technique [27].

A full-thickness gluteal inner thigh rotational flap is reserved for complex refractory fistula. With the patient in the lithotomy position, a mediolateral episiotomy is made at 5 o'clock extending from the introitus to the vaginal apex. Dissection is continued into the pararectal space. A 4 × 12 cm inner thigh flap is prepared by making an inverted U-incision lateral to the labia major extending from the ischial tuberosity inferiorly, and to the pubic rami superiorly. This incision preserves the blood supply from the internal pudendal artery and innervation from the labial

branches of the internal pudendal nerve and perineal branches of the posterior cutaneous nerve of the thigh. Dissection is carried to the level of the fascia. The episiotomy is extended to the inferomedial aspect of the flap to allow complete mobility. This creates a lateral gluteal rotational inner thigh flap and a medial labial flap. The labial and gluteal rotational inner thigh flaps are crossed; the inner thigh flap medially and the labia flap laterally. The inner thigh flap is transferred and sutured to the vaginal defect. This is a functional full-thickness flap that provides good sensation, and adequate vaginal width and depth. A variation of the full-thickness inner thigh flap is the Singapore island flap [28]. The dissection of the flap is similar except that the episiotomy is avoided and the flap is tunneled to the defect. The epithelium of the flap is removed except for the area that is covering the fistula. This flap is used in complex fistula repair and may be preferred to the full-thickness rotational inner thigh flap when there is already adequate vaginal access.

There are several reports of gracilis myocutaneous flap for radiation-induced fistula in which it is used for vaginal reconstruction [29, 30]. We seldom find it necessary to perform this technique because the rotational gluteal flap can duplicate many of the same functions of this gracilis graft without the associated morbidity and cosmetic defects.

The most well-described interposition is the omental flap which has increased success rates for abdominal repair in retrospective studies [26, 31]. The omentum is based on the right or left branch of gastroepiploic artery, although typically it is based on the right, which is usually larger and more caudal. In cases of bowel resection, the mesentery can be preserved and serve as a useful interposition which has similar properties as the omentum with a well-vascularized blood supply and lymphatic drainage to decrease inflammation and promote healing. Other tissue interposition flaps that have been reported are bladder flaps [32], free bladder mucosal flaps [33], peritoneal flaps [34], urachal flaps [35], and rectus myofascial flaps [36].

Selection of closure and reconstruction of the urethra after urethrovaginal fistula requires expertise and experience due to its complexity. Urethral reconstruction centers on different techniques, primarily urethral closure, vaginal and bladder flap advancement which includes pedicle flap (labia minora and anterior or posterior bladder), and use of grafts [37]. Surgical planning of the urethra reconstruction technique may influence vaginal incision location. In a complex fistula resulting in damage of nearly the entire urethra that can extend potentially to the bladder neck, a urethral reconstruction using vaginal or bladder flap construction with interposition of tissue would be preferred to a primary closure. It would be advised to place ureteral stents as the fistula may distort the anatomy and ureteral injury may be avoided during the repair.

Vesicovaginal Fistula

Background

Vesicovaginal fistula is an abnormal, extra-anatomic connection between the bladder and vagina. Women with VVF suffer enormous amounts of physical, social, and psychological limitations. Though uncommon in Western countries, it remains a widespread problem in underdeveloped countries due to obstructed labor [38]. In developed countries, VVF is most often a complication of pelvic surgery (hysterectomy), where we will direct the majority of our attention. VVF can be associated with urethrovaginal fistula and/or rectovaginal fistula [17, 39]. In this section, we will cover the etiology, diagnosis, and repair (both vaginal and abdominal approach) of VVF.

Etiology

VVF in the USA and developed countries are the result of gynecologic pelvic surgery in over 80% of cases, with the remaining causes being comprised from radiation, malignancy, trauma, and obstetric instrumentation during childbirth [2]. Hysterectomy accounts for 91% of the gynecologic pelvic surgeries that resulted in VVF [17]. A total of 600,000 hysterectomies are performed annually in the USA and nearly a third of women have hysterectomies for benign disease [40–42]. The reported incidence of fistula after hysterectomy for benign disease is reported to be 0.1% to

0.4%. The risk of fistula increases about tenfold to 1–4% after radical hysterectomy [43]. The majority of hysterectomies in the USA are performed abdominally, with a Cochrane review reporting the risk of fistula formation is similar regardless of the approach, although there is increased risk of injury of the urinary tract with laparoscopic hysterectomy [44, 45]. A national database registry study in Sweden found that abdominal and laparoscopic surgery had the highest fistula rate [46]. Fistula formation after hysterectomy is thought to be the result of unrecognized injury to the urinary tract at the time of surgery. The injury may be directly to the bladder itself, or from inadvertently placed sutures that result in tissue necrosis. These injuries result in a urinoma that accumulates and drains through the vaginal cuff [43]. Preoperative risk factors for fistula formation after hysterectomy for the benign and malignant disease are diabetes, smoking, history of cesarean section, endometriosis, pelvic inflammatory disease, and radiation [47–49]. Intraoperative findings of pelvic adhesions, bladder injury, extensive surgery, and higher stage cancer have higher risk of fistula [47–49]. Performing a subtotal hysterectomy with preservation of the cervix decreased the fistula rate which may be the result of a less extensive surgery [46]. Attention to avoiding injury to the urinary tract and performing a cystoscopy during difficult dissections where bladder injury is suspected may prevent a fistula [1]. It may be helpful to retrograde fill the bladder with dye or saline in these select cases to detect injury. Observation of the urine draining from the Foley during hysterectomy should be clear and if there is question further investigation is indicated.

Pelvic surgery with mesh-augmented repair can be is another cause of fistula. There are reports of transvaginal mesh causing VVF at low rates 0.29% [50]. A mid-urethral sling may inadvertently injure the bladder and cause a VVF [51]. This reinforces the importance of a cystoscopy at the time of sling placement to prevent urinary fistula. As the number of transvaginal mesh surgeries has been increasing, there may have been a rise in the number of urinary fistula from mesh complications [52]. This trend may reverse as a result of decreased transvaginal mesh-augmented repairs due to the FDA safety communication in July 2011 regarding complications related to transvaginal mesh for POP. Radiation-induced fistula represents a minor portion of VVF. The mechanism of injury is due to obliterative arteritis, resulting in ischemia which also produces inflammation of encompassing tissue that must be taken into account [53]. Presentation of radiation fistula can occur acutely or be delayed for several years. Suspicion of recurrent cancer or secondary malignancy must be considered with a history of radiation fistula.

Diagnosis

VVF commonly presents with constant urinary incontinence that is distressing and may be intensified as a result of a surgical complication, usually total abdominal hysterectomy, which remains the most common approach in the USA. Usually, fistulae appear between the 7th to 12th postoperative day [54]. As previously noted, the diagnosis of a vesicovaginal fistula can most often be made upon a vaginal examination. The location of VVF after hysterectomy is usually a single fistula at the vaginal cuff, although it may present as a complex VVF with multiple fistulas.

A urethral catheter with retrograde filling of the bladder with dye (dilute methylene blue), with a tampon or gauze in the vagina, may demonstrate the fistula on examination. A urinary fistula can also be identified after administering phenazopyridine once it is excreted in the urine. A negative tampon test however does not rule out a fistula, and clinical suspicion, in many cases, is required to make the diagnosis. Evidence of the fistula site is commonly found with surrounding inflammation, granulation, and tissue defect.

There are many different opinions and no consensus on the imaging required during the evaluation of VVF. As mentioned previously, our practice is to completely evaluate the patient to attempt to address all problems at the initial repair which may require a voiding cystogram and additional position changes (lateral and oblique) to increase intradetrusor pressure during voiding to visualize small fistulae. Of note, the lateral views may best demonstrate the fistulae when there is a direct connection between the bladder and the vagina, or when the connection is indirect, and enters a collection/sinus tract before draining into the vagina (Fig. 10.1). In addition, VCUG will demonstrate concomitant urethro-

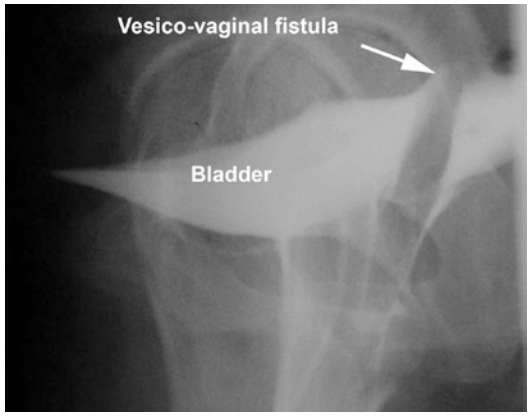

Fig. 10.1 A VCUG of vesicovaginal fistula

Fig. 10.2 The fistula is identified with a probe

vaginal fistulae, the degree of vaginal prolapse, and stress incontinence [2]. Prior to surgery, a dedicated physical examination, urine analysis, culture if required, cystoscopy, and VCUG are performed with selective CTU and tridimensional reconstruction in selected cases. In addition, we place bilateral urethral stents preoperatively, when the fistula is noted/discovered to be near the ureteric orifices.

Timing of Repair

Classical teaching advocates waiting for 2–4 months before closure. This allows for spontaneous healing while the bladder is under continuous drainage, but this is only useful for small fistulas (<5 mm). Others advocate a delay of 4–6 weeks before attempting repair; however, a successful repair can be done as early as 2 weeks after diagnosis under certain conditions: if there is no evidence of infection, there is no history of radiation to the area, and if it is not an ischemic fistula.

Treatment

Conservative Treatment

The goal of surgical repair is to have resolution of the fistula with the least morbidity. In select circumstances, it is reasonable to attempt a trial of catheter for about 4 weeks [55]. There are reports of spontaneous resolution of fistulas that are simple and small with the overriding principle that there should be no delay in definitive repair [56–58]. Consideration of endoscopic treatment with fulguration and fibrin glue has been successfully reported in small case series when fistulas are less than 3.5 mm in size [59, 60]. This is a reasonable approach when patients meet these defined criteria; however, few patients are candidates for these conservative or minimally invasive procedures and require surgical repair. Patients with a history of complex, large, or radiation-induced fistulae should proceed with a definitive repair, as minimally invasive treatment is futile.

Trans Vaginal Repair

In this section, we describe our basic technique and adjuvant procedures done in complex cases. With the patient in lithotomy position, surgical repair begins with vaginal exposure with a ring retractor and vaginal speculum. The key to performing this repair is the identification of the fistulous tract. A cystoscopy is performed to identify the fistula and a wire is placed through it. A 16–18 Fr catheter is inserted into the bladder. The vaginal cuff is grasped with Allis clamps to expose the fistulous tract. The tract is then dilated with hollow or Goodwin sounds or over a guidewire to allow passage of an 8–10- Fr catheter (Fig. 10.2). The catheter is an important aid in the exposure of the fistula and retraction of the bladder during the repair. A circumferential incision is made less than 1 cm from the fistula track. An inverted U-incision is made on the anterior vaginal wall and it is mobilized 3–4 cm to create the anterior vaginal flap (Fig. 10.3a–d). An inverted U posterior vaginal wall flap is created from the cuff to expose the prerectal fascia, the vesico-

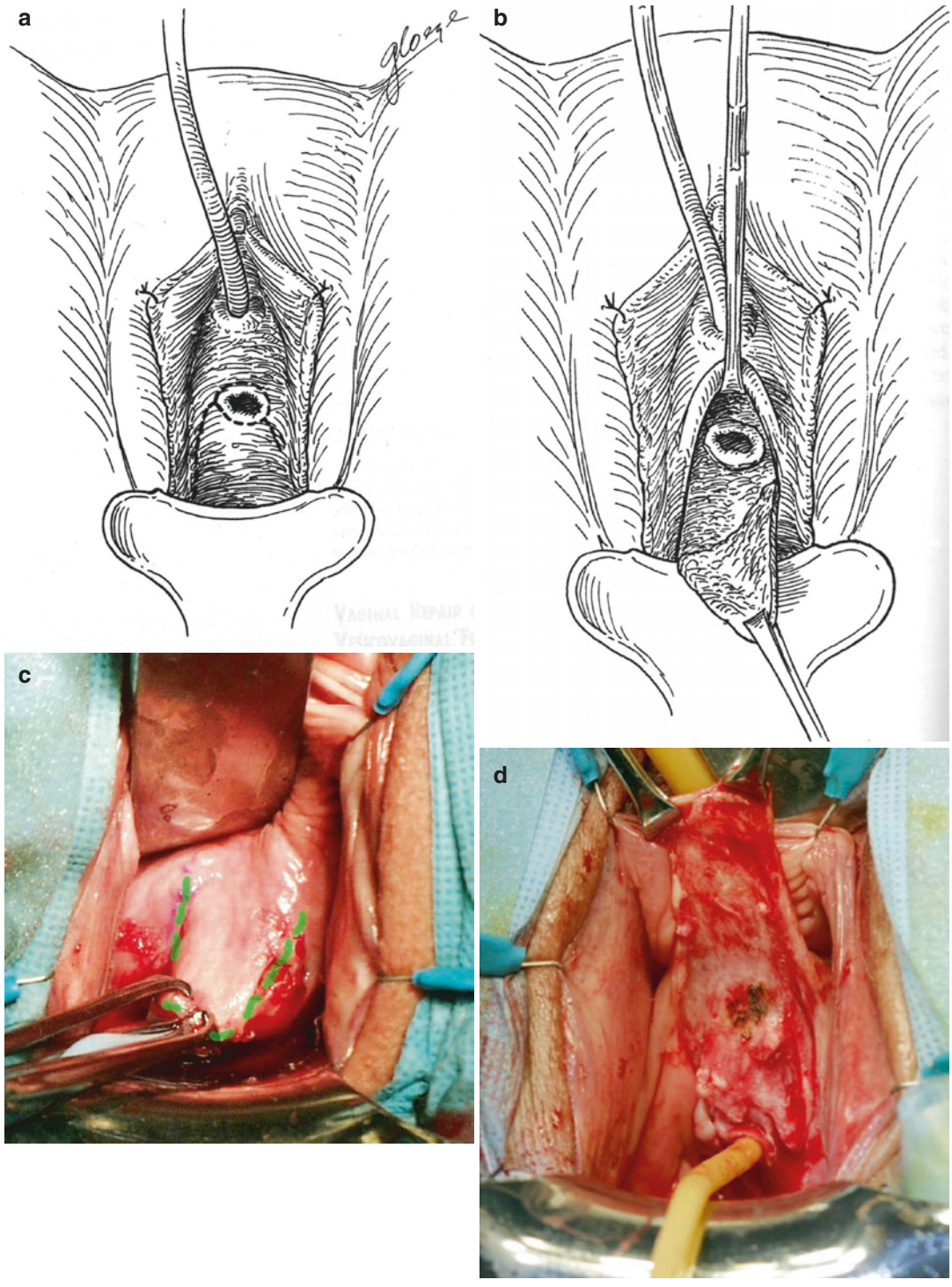

Fig. 10.3 (**a**–**d**) The vaginal epithelium is then incised in a U-shaped fashion and separated the vaginal epithelium from the underlying bladder

rectal space, and the posterior cul-de-sac, where the peritoneal flap can be retrieved.

The fistula tract is isolated and closed with 2-0 or 3-0 delayed absorbable interrupted sutures (Figs. 10.4, 10.5, 10.6, 10.7, and 10.8). Care is taken to incorporate all the fistulous tract and the bladder wall into the closure. We omit excision of tract unless there is a concern of malignancy or extensive necrotic tissue. We do not excise the fistulous tract because a small fistula stays small, but excision of the margins may turn a small fistula into a very large defect.

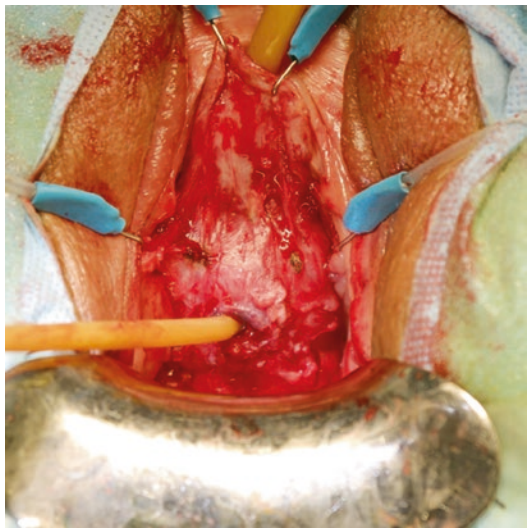

Fig. 10.4 A Foley is then placed into the opening in the bladder

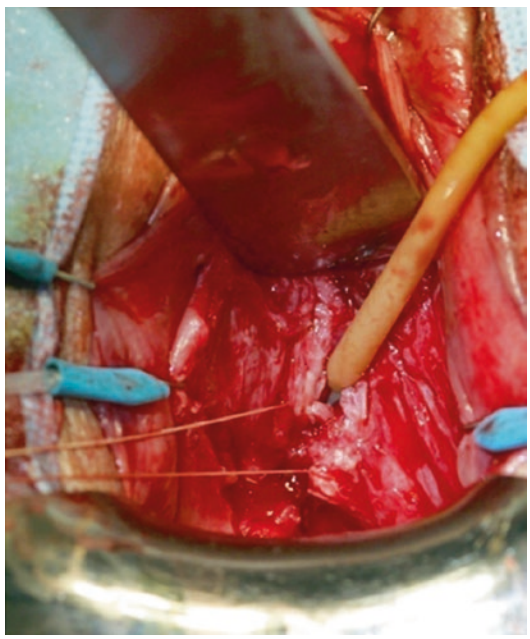

Fig. 10.5 Traction is placed on the Foley to bring the fistulous opening forward. Several sutures are placed across the opening, around the Foley

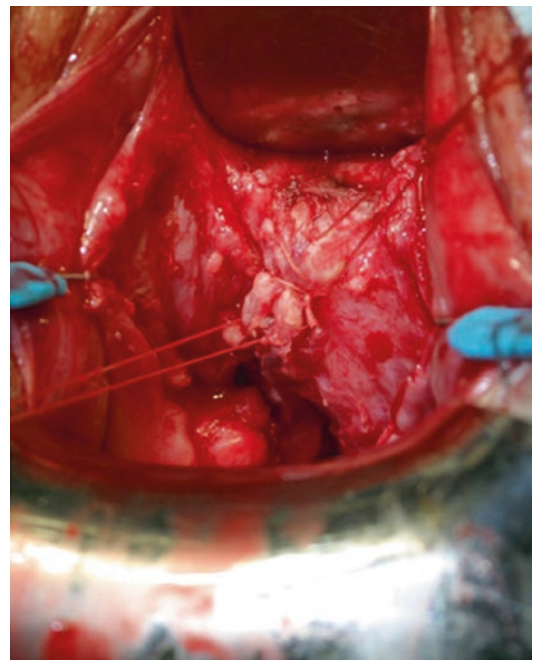

Fig. 10.6 The Foley is then deflated and removed

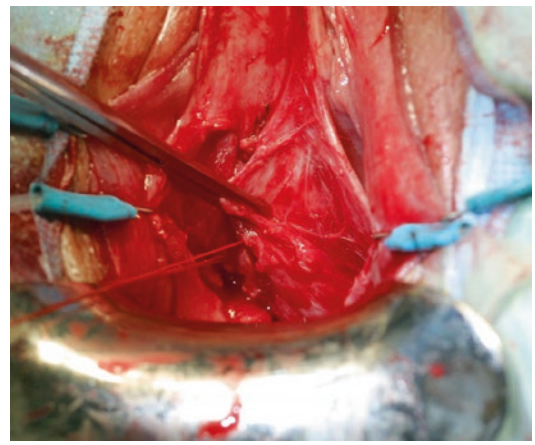

Fig. 10.7 The sutures are tied closing the opening in the bladder

Excision of the tract may also lead to bleeding, which may necessitate coagulation of the margins, impairing the repair. The fistulous tract is excellent anchoring tissue for protecting and reinforcing the closure. If the fistula is next to the ureteric orifice, there is no need for reimplantation, a stent is simply inserted under direct visualization. Once the closure is complete, the bladder is then filled with dilute indigo carmine to ensure there is no extravasation, thereby testing the integrity of the repair. A second layer of sutures, 1 cm from the fistula, are then imbricated over the tract with 2-0 or 3-0 delayed absorbable interrupted suture for the second layer of closure. A double-layer peritoneal flap is then dissected from the vesico-rectal space, mobilized, and advanced 2–3 cm distal to the fistula closure. The flap is sharply dissected and mobilized from the cul-de-sac so that it can be advanced 2–3 cm distal to the fistula. This flap is approximated with 3-0 absorbable interrupted sutures. A small segment of the distal flap is excised and the posterior flaps, advanced, and closed beyond the fistula side with absorbable, 2-0 interrupted suture, resulting in a 4-layer closure. A Martius flap may also be used if the fistula location is more distal (Figs. 10.9, 10.10, 10.11, 10.12, 10.13, and 10.14).

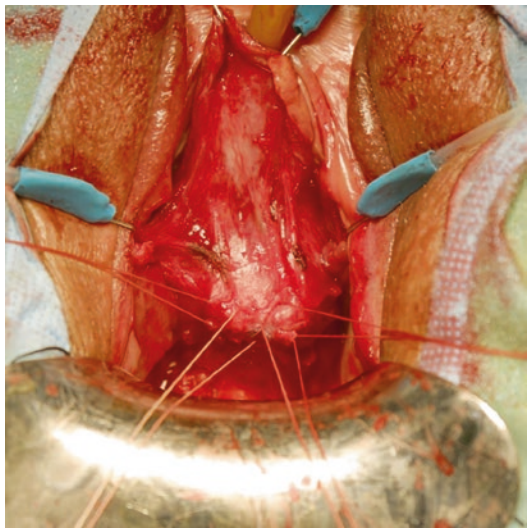

Fig. 10.8 After bladder closure

Latzko Partial Colpocleisis

The Latzko partial colpocleisis is the traditional technique for VVF repair. The Latzko technique is usually utilized to repair proximal post-hysterectomy fistulae. It involves a circumferential elliptoid incision around the fistula with wide

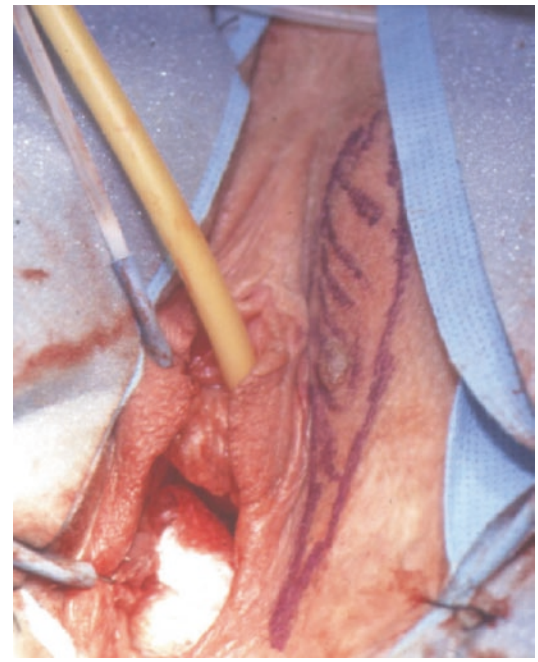

Fig. 10.9 Location of the Martius flap is marked on the skin

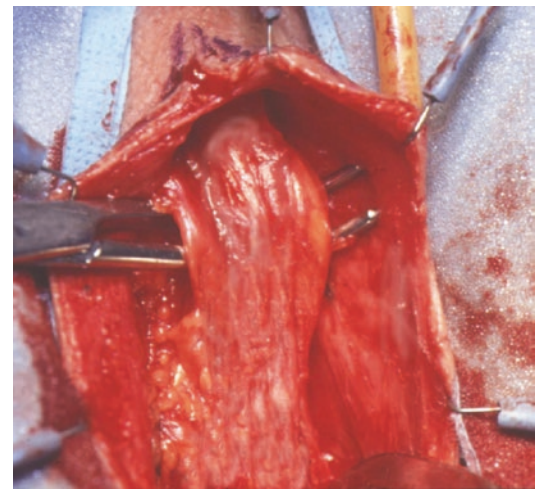

Fig. 10.10 The Martius flap is then isolated

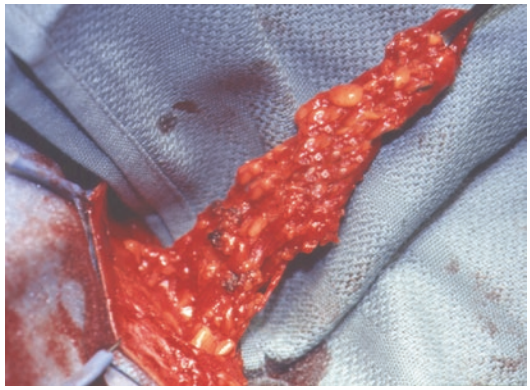

Fig. 10.11 The proximal end of the flap is ligated

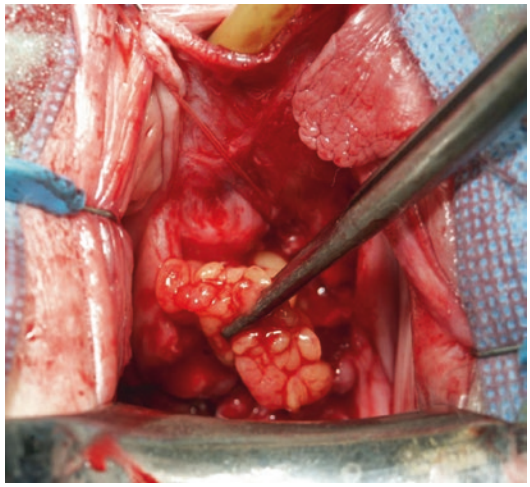

Fig. 10.12 The Martius flap is placed over the closed defect in the bladder

mobilization of the vaginal epithelium in all directions. The fistula tract is closed and the repair is reinforced by an inverted layer of the perivesical tissue. The suture lines are overlapping in this repair. Potential advantages of this approach are decreased morbidity from less blood loss and shorter operating time. We prefer our approach as described above, as it avoids vaginal shortening and an overlapping suture line which may result in recurrence. It is worth noting, however, that some authors report low recurrence rates with the traditional Latzko repair, and that there is vaginal shortening only when there is an already shortened vagina [61].

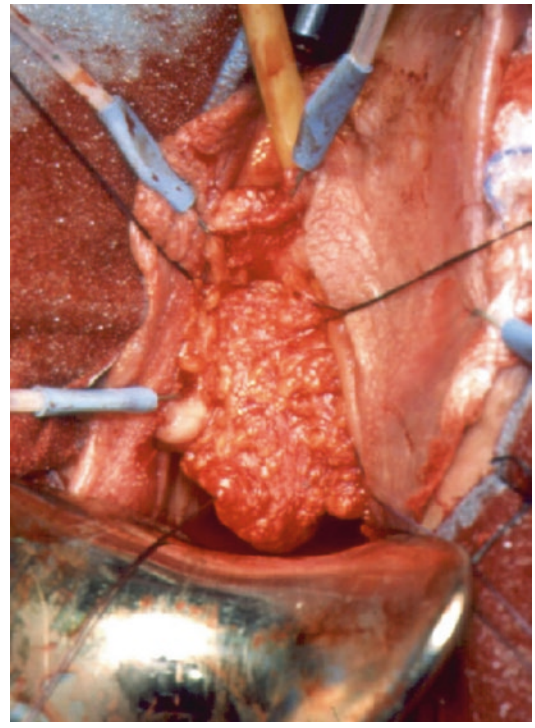

Fig. 10.13 The flap is sutured into place

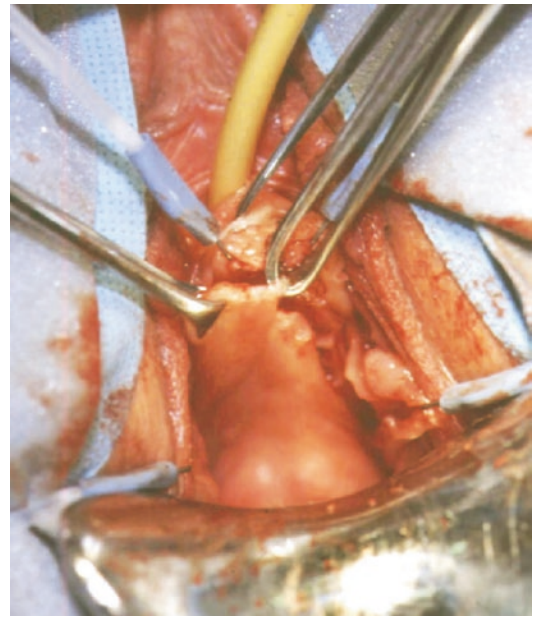

Fig. 10.14 Flap of vaginal epithelium is advanced

Abdominal Repair

This may include open, laparoscopic, or robotic approaches. An absolute indication for the abdominal approach is a contracted bladder capacity and/or the need for ureteric reimplantation. Abdominal repair is typically done via the O'Conor technique. In instances of intraperitoneal pathology, concomitant ureteric reimplant, or bladder augmentation, or the need for bowel diversion, this is the preferred technique. Our approach begins with a midline incision that extends from the umbilicus to the pubic bone. Once the peritoneum is entered, the bladder is identified by retrograde filling via the catheter. A probe is then inserted into the vagina, and the vaginal wall retracted superiorly. The bladder is then dissected free from the vaginal wall until the fistulous tract is encountered. The fistulous tract is then opened and no bi-valving of the bladder is required. The vagina is then dissected free from the bladder for a distance of 3–4 cm surrounding the area of the fistula. The bladder is then closed in layers, with indigo carmine injected to assure the integrity of the closure. The vaginal incision is then closed with a segment of omentum, or free peritoneum is interposed between the bladder closure and the vaginal closure. Alternatively, the bladder can be bi-valved (which is the traditional O'Conor approach), extending the incision to include the fistula, which can be biopsied if there is concern for malignancy. The bladder is dissected and mobilized away from the vagina so that it is prepared for later closure. The bladder and the vagina are closed in two layers with interposition of tissue flap for added security. The most described interposition is the omental flap which has increased success rates in retrospective studies [26, 31]. In cases of bowel resection, the mesentery can be preserved and serve as a useful interposition material, which has similar properties similar to omentum, with a well-vascularized blood supply and lymphatic drainage to decrease inflammation, and promote healing.

Laparoscopic/Robotic

The first description of a laparoscopic VVF repair was by Nezhat in 1994 [62]. The robotic repair was first described in 2005, which is a platform that allows more surgeons to perform the technical aspects of this surgery of suturing and knot tying that are technically demanding with laparoscopic surgery [63]. The success rates are about 90% or greater in the few case series reporting on these techniques [21–23, 64, 65]. There is one study comparing open to robotic repair of VVF with similar outcomes [21]. As in open repair, the robotic approach allows the surgeon to perform ureteric reimplant when indicated. In another study, Bora et al. performed robotic-assisted VVF repair in 30 patients: 11 with complex fistulas, 9 had failure of a previous repair, and 27 were found to have a supratrigonal VVF [19]. No recurrence was seen in 28 patients and the mean duration of follow-up was 38 weeks. These emerging technologies appear to be promising for the surgeon skilled in robotic or laparoscopic surgery; however, the vaginal approach is a still faster, minimally invasive outpatient surgery that allows for excellent exposure of the fistula with good functional and anatomical results.

Complications

Complications include infection, bladder spasm, and vaginal bleeding. These complications should be treated, as they raise the risk of recurrence. Postoperative antibiotics are routinely given for about 2 weeks postoperatively, anticholinergics, or B & O suppositories may be needed to prevent bladder spasms, and patients should be advised to have pelvic rest for 3 months postoperatively. The most common complication is UTI (8%) regardless of the approach [66]. The most significant complication is fistula recurrence, and every attempt should be made to prevent it. Recurrent fistula should be treated with a tissue interposition, and at least a 3-month delay in repair. Rare complications include injury to the ureters, bowel, and rectum, and should be discussed with the patient during the preoperative informed consent process.

Urethrovaginal Fistula

Background

A urethrovaginal fistula is an abnormal connection between the urethra and the vagina that may

be the result of obstetric, iatrogenic, neoplasm, trauma, or infection. This should not be confused or grouped together with vesicovaginal fistula because the etiology, surgical repair, and potential complications of urethrovaginal fistula differ. Urethrovaginal fistula is a rare condition due to the female urethra being seldom involved in injury because of its short length and protection from the pubic bone [67, 68]. The majority of urethrovaginal fistulas in developed countries are iatrogenic and arise from pelvic surgery or radiation and less often from obstetric procedures during childbirth [2, 38, 69]. Increasingly, these fistulas are seen as the result of mesh mid-urethral sling placement [70].

Etiology

Urethrovaginal fistulas in developed countries are the main focus and can be divided into two main categories: causes from vaginal/pelvic procedures which make up the majority and less often from radiation. Currently, with the increased use of mesh, mesh exposure or erosion into the urethra needs to be considered as a source of fistula. There are case reports of synthetic mid-urethral slings causing urinary fistulas [51, 71]. This mechanism of injury is likely unrecognized iatrogenic injury of the urethra from urethral perforation which increases the risk of fistula formation [72–74]. Urethral diverticulectomy surgery is the most common surgical cause of urethrovaginal fistula [2]. This may be the result of incomplete excision of the diverticulum or inadequate urethral closure without sufficient tissue interposition.

Radiation fistula formation can present immediately or can occur years after exposure and may contribute to 15% of urethrovaginal fistulas [2, 10]. There should be consideration of malignancy when patients have a history of pelvic cancer or radiation treatment. Rare cases of urethrovaginal fistula in the USA may be the result of trauma, injury during childbirth, malignancy, or infection. As childbirth techniques have improved, there are less injuries and trauma contributing to urethrovaginal fistula [38]. The use of forceps or instruments may result in laceration of the urethra that if not identified and repaired can lead to urethrovaginal fistula. Blunt trauma with pelvic fracture rarely can cause an avulsion of the urethra or develop into a urethrovaginal fistula with an incidence range of 0–6% [75]. Instrumentation of the urethra is another unusual cause of fistula [76, 77]. Chronic indwelling Foley can cause pressure necrosis of the bladder neck and distal urethral which can form a hypospadic urethra and urethrovaginal fistula [78–80].

The majority of urethrovaginal fistulas in undeveloped countries originate from prolonged obstructed labor and are not iatrogenic as in western countries. These urethrovaginal fistulas are due to ischemia and commonly involve the bladder and urethra with extensive tissue loss. The mid-urethral sphincteric complex may be irreversibly damaged making for a tenuous repair with unwanted outcomes [75, 81].

Treatment

Vaginal Surgical Repair

This is a description of a urethrovaginal fistula that is closed primarily (Figs. 10.15 and 10.16). Surgical repair begins with vaginal exposure with a ring retractor and vaginal speculum. A Foley catheter is inserted into the urethra. A small Foley catheter is inserted in the fistula with dilation of the tract if necessary. Injection of retrograde dye

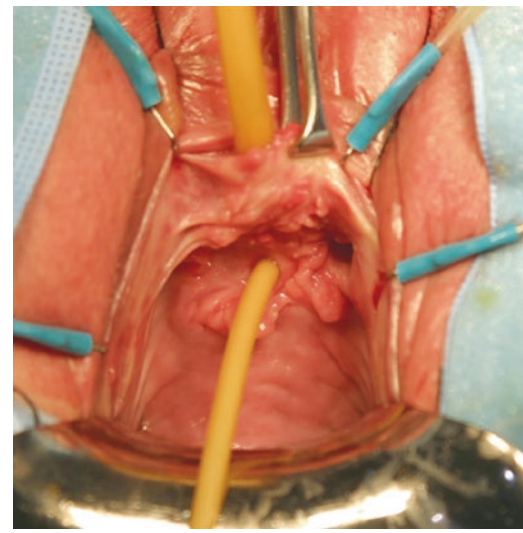

Fig. 10.15 Urethrovaginal fistula with a Foley catheter used as a retractor

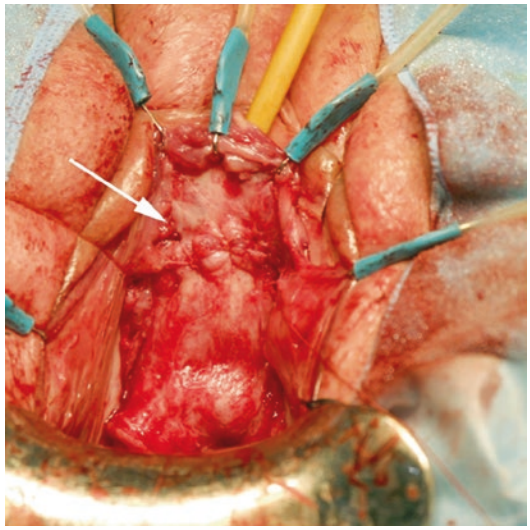

Fig. 10.16 Closure of the periurethral fascia

in the urethral meatus may help to identify a small fistula. An inverted U-incision is made on the anterior vaginal wall. The anterior vaginal wall flap is dissected and freed so that it has mobility to advance 2 cm distal to the fistula. The anterior vaginal wall flap is dissected lateral and proximal to the fistula which facilitates creation of the flap by avoiding scarring and friable tissue. Lateral and distal vaginal flaps are dissected which expose the fistula tract and the periurethral fascia. Once the vaginal wall is separated and is adequately mobilized, a transverse incision of the periurethral tissue is made at the level of the fistula as in a urethral diverticulectomy repair. Superior and inferior flaps of the periurethral fascia are created, isolating the urethral wall with the catheter in place. The fistula is closed in 2 layers with the urethra as the first layer closed transversely like a Heineke-Mikulicz technique. The periurethral fascia is closed in a transverse fashion to cover the area of reconstruction. The fistula tract is not routinely excised because it provides excellent anchoring tissue for closure, avoids creating a larger defect to repair, and prevents bleeding from the fistula tract edges that can become devitalized from electrocautery during the control of bleeding [10, 82]. Optionally, creation of a Martius flap to cover the periurethral fascia (radiation, multiple surgeries, large defects, and poor tissue quality) is performed. The vaginal wall flap is advanced to cover the area of reconstruction. The Foley catheter for is left for 2–3 weeks and removed with a negative voiding trial or VCUG. Success rate has been reported at 95% [83].

Complications

Complications should be discussed preoperatively so the patient has realistic expectations after repair. Patients may develop obstructive voiding due to urethral stenosis in 5–20% of cases [69, 84]. There is a 33–50% chance that they will develop stress incontinence symptoms requiring an anti-incontinence procedure [68, 83]. Patients requiring extensive urethral reconstruction or a history of radiation with an immobile poorly vascularized urethra may fail fistula repair necessitating a bladder neck closure and urinary diversion.

Ureterovaginal Fistula

Background

Ureterovaginal fistula is an abnormal communication between the ureter and the vagina. It can result from inflammation, malignancy, exposure to radiation, or prior pelvic surgery. It is a relatively uncommon site for fistula disease and a high degree of suspicion is needed to pursue appropriate diagnosis and treatment. Urinary incontinence is a common presenting complaint – often continuous in nature. Distinction should be made between continuous urinary leakage that has been lifelong vs new onset, as the former suggests a congenital defect such as ectopic ureter while the latter lends more suspicion toward acquired fistula disease.

Etiology

Iatrogenic injury during pelvic surgery is the most common cause of ureterovaginal fistula [85], with ureteral injury rates up to 2% following gynecologic surgery [86]. Ureterovaginal fistula can be present with fistula disease in other locations; for example, it can be seen in up to

12% of patients with VVFs [4]. In addition to continuous urinary leakage, some patients will present with symptoms of flank pain or nausea if upper tract obstruction proximal to the fistula is present. Upper tract imaging plays in important role in diagnosis by potentially providing information about presence and location of fistula as well as define features of adjacent anatomy that can be important in planning treatment, CT or MR urography are particularly helpful for this (Figs. 10.17 and 10.18) [87]. Diagnosis can be facilitated by the double-dye tampon test discussed earlier in this chapter. Another clinical feature that distinguishes this from the continuous leakage of VVF is that patients will generally report continued normal voiding cycles because bladder filling is maintained by the contralateral ureter.

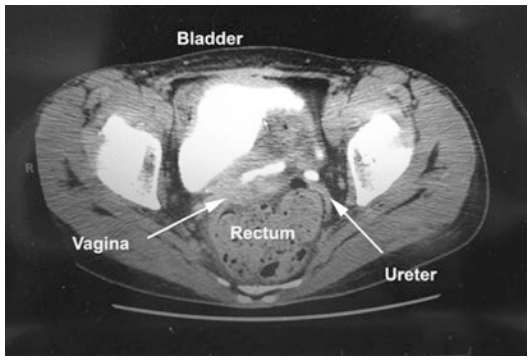

Fig. 10.17 Axial CT image showing contrast extravasation into vaginal cuff in the region of the distal ureter, contrast has also drained into the bladder

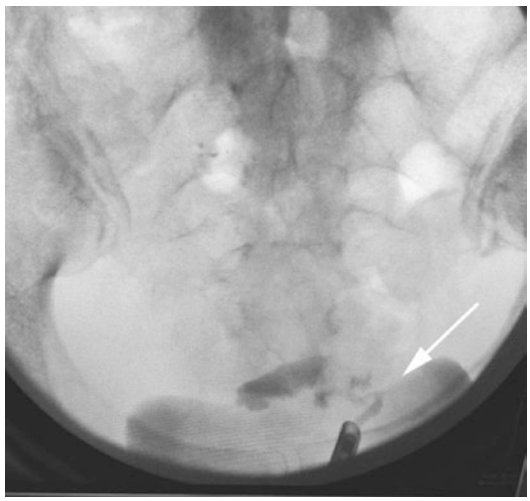

Fig. 10.18 Patient with urine leakage per vagina following vaginal hysterectomy and cystocele repair, cystoscopy and cystogram were unremarkable. Retrograde injection of contrast into left ureter reveals extravasation of contrast into vaginal cuff, confirming the presence of ureterovaginal fistula

Surgical Repair

The goals of treatment are to preserve upper tract function and to resolve urinary leakage, with the latter being the more urgent priority [88]. In some cases, endoscopic management alone may be successful. Antegrade stent placement can be pursued if attempts at retrograde stent placement are not successful. Endoscopic decompression with the use of a temporary stent has been reported to be successful in approximately 50% of cases [89]. If ureteral obstruction precludes successful stenting, or if leakage persists in spite of stenting, then surgical repair can be pursued. While there has been some debate about the value of surgical timing with immediate vs. delayed repair, current opinion favors immediate repair with no benefit seen to delaying surgery [10].

Since the fistula is usually located in the distal ureter in a region of scarring/inflammation from the original inciting cause of the fistula, ureteral reimplantation (ureteroneocystostomy) is generally favored over attempts at primary repair. Surgical technique involves mobilization of the ureter proximal to the fistula, taking care to avoid excessive skeletonization of the ureter to preserve blood supply and reduce postoperative risk of stenosis or stricture. A refluxing (non-tunneled) anastomosis is generally preferred to reduce the risk of obstruction or high pressures in the upper tract that could impair success of the surgery. If needed to reduce tension, additional interventions such as a psoas hitch and/or Boari flap can be made (Fig. 10.19). Reimplantation can be accomplished using open, laparoscopic, or robotic-assisted approaches based on surgeon preference [90]. Fortunately, success rates for treatment of ureterovaginal fistula with surgical ureteral reimplantation are very high, consistently >90% in contemporary series [85, 91].

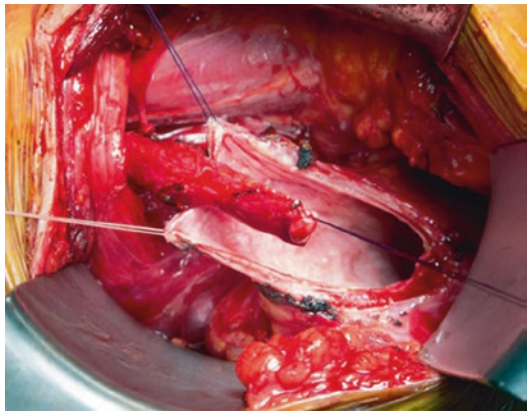

Fig. 10.19 Use of Boari flap to reduce tension on anastomosis in ureteral reimplantation

Complications

Complications similar to the above urinary fistulas (i.e., bleeding, infection, bladder spasms) can be seen with ureterovaginal fistula repair. Complications specific to this type of fistula include damage to the involved ureter, which may present late after the repair. Fistula persistence or recurrence can happen as a result of obstruction, ischemia, or tension on the anastomosis if reimplantation is performed. Ureteral stricture can also occur due to ischemia from excessive skeletonization during mobilization, or as a sequela of the original underlying cause (i.e., inflammation, prior radiation). For this reason, upper tract imaging, such as renal sonography, should be done 4–6 weeks after stent removal to assess for hydronephrosis. If a patient presents earlier with flank pain then more urgent upper tract imaging should be done to assess for obstruction. In some patients who had chronic obstruction prior to fistula repair, there may be some residual hydroureteronephrosis that persists even after a successful repair. In these cases, a nuclear medicine renogram can help determine whether or not obstruction is present. If this test is done in a patient who had a refluxing reimplant, then a catheter should be placed in the bladder during the study to prevent erroneous reporting of delayed drainage time from the affected side.

Rectovaginal Fistula

Background

Rectovaginal fistula is an extra-anatomic epithelial connection between the rectum and vagina. It is a disabling disease that severely devastates and impacts an individual's social life and self-esteem.

Etiology

RVF is most often a complication after a traumatic vaginal delivery that occurs in about 0.1% of vaginal deliveries in modern developed countries [92, 93]. Fistula formation is the result of high-grade rectal lacerations, grade 3 and 4, involving the perineal body and rectum that is unrecognized or becomes infected after repair. They may also develop as a result of prolonged or obstructed labor, causing pressure necrosis of the rectovaginal septum [94]. Risk factors for high-grade rectal lacerations at the time of vaginal delivery include midline episiotomies, use of forceps, first vaginal delivery, and increased birth weight of the fetus [95]. Investigation should be given to additional causes of RVF from pelvic surgery including low anterior resection, synthetic mesh for POP, hysterectomy [96], pessary [97], colorectal or gynecologic malignancy, history of radiation, pelvic abscess, and inflammatory bowel diseases which include Crohn's disease, ulcerative colitis, and diverticulitis [98].

Surgical Repair

Tissue Interposition

The majority of RVF repairs involve interposition of tissue to prevent recurrence with little added morbidity. Interposition of a Martius flap after a transvaginal repair of low fistula is our preference. We typically reserve gluteal rotational inner thigh flaps for high fistulas, difficult vaginal access, large defects, or fibrotic vaginal tissue that is suboptimal for fistula closure.

Vaginal Repair

Routine administration of broad-spectrum antibiotics and mechanical bowel preparation are given preoperatively. The transvaginal repair is performed with a multilayer closure with routine use of tissue interposition. Fecal diversion is performed selectively. The patient is positioned in high lithotomy position and the fistula is exposed with a ring retractor. A Foley is inserted into the fistula tract and can be used as a retractor. A U-incision is made on the posterior vaginal wall and it is mobilized 3–4 cm to create a vaginal flap. The vaginal wall is dissected free on the lateral wall and the prerectal fascia is dissected to create a flap that will be cover the fistula at the end of the procedure. The fistula tract is closed in 2 layers with interrupted delayed 3-0 absorbable suture that results in a watertight closure. The first layer includes the rectal and vaginal wall. The second layer includes the perirectal fascia that is advanced 2–3 cm over the fistula repair. A Martius flap that had been previously prepared is placed for additional coverage. A vaginal flap is advanced for a 4-layer closure (Figs. 10.20, 10.21, 10.22, 10.23, 10.24, 10.25, 10.26, 10.27, 10.28, 10.29, 10.30, 10.31, 10.32, and 10.33). There have also been descriptions of biological material used to reinforce the fistula repair [99].

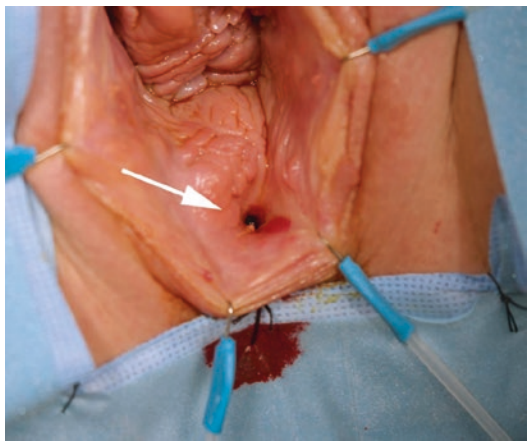

Fig. 10.20 A small, distal rectovaginal fistula (white arrow)

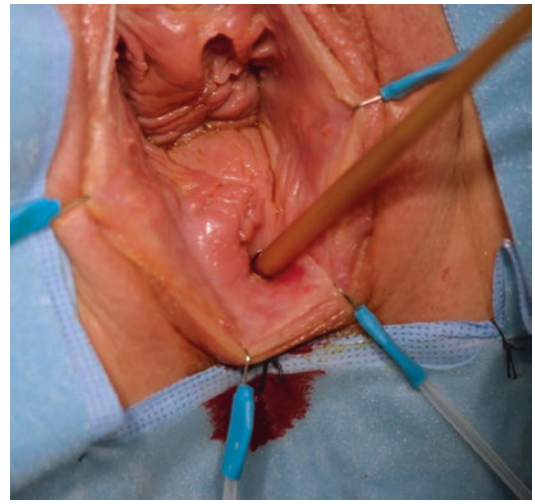

Fig. 10.21 A Foley catheter is inserted into the fistula tract. The catheter is used to facilitate the dissection of the fistula tract

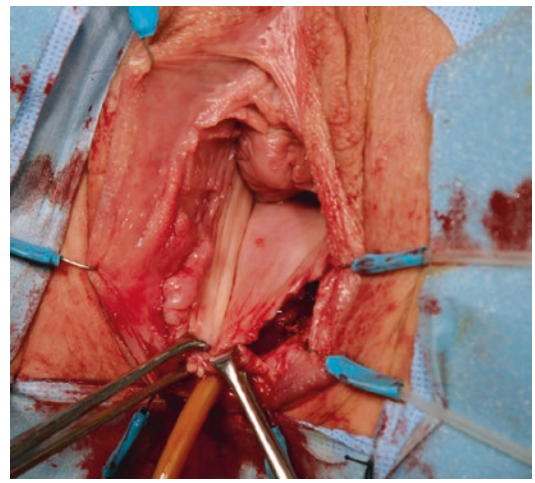

Fig. 10.22 A U-incision is made in the posterior vaginal wall and a flap is developed with the distal tip in the area of the fistula. The flap is extended proximally 5–8 cm. If prerectal fascia is present, it is used to create another flap, which is later used to reinforce the closure of the fistula. Distal to the fistula, a flap of vaginal wall is developed to the posterior fourchette, or distal vagina 3–4 cm from the fistula

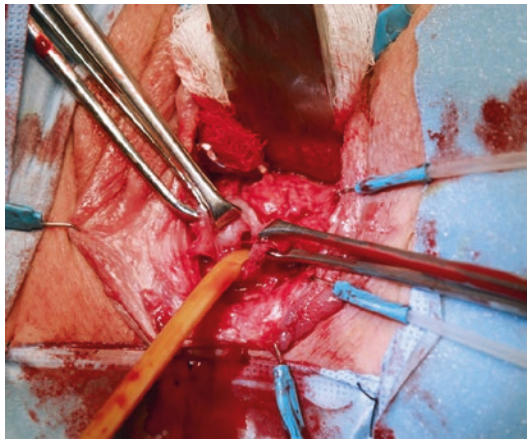

Fig. 10.23 The Foley catheter remains in the fistulous tract while the anterior rectal wall is exposed

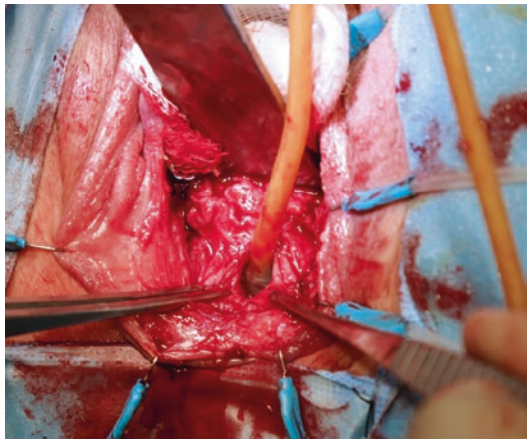

Fig. 10.24 Wide exposure of the fistula is obtained for several centimeters around the fistula, leaving a small ring of fistulous tract in place

Transanal Repair

The transanal approach is most commonly used for a low fistula. It begins with the patient in a prone jackknife position. A rectal advancement flap is created that includes the mucosa, submucosa, and the circular muscular fibers (internal sphincter). The flap is dissected 5 cm proximal to the fistula with its proximal base being twice the width of the apex. The fistula tract is excised and the rectal side of the fistula is closed leaving the vaginal side open.

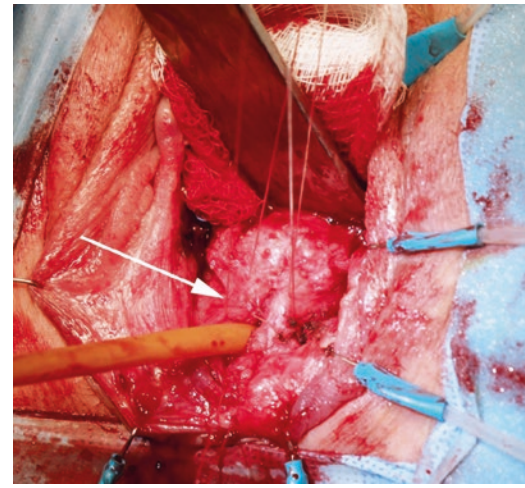

Fig. 10.25 The rectal wall and margins of the fistula tract are incorporated in the closure of the fistula tract (white arrow)

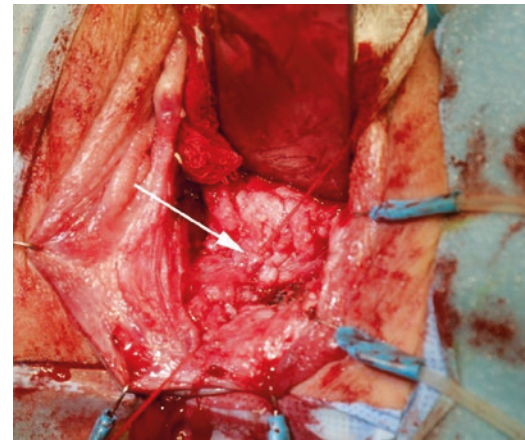

Fig. 10.26 Two layers of delayed absorbable sutures are used to close the fistula (white arrow). The rectum is irrigated with a diluted iodine solution. The absence of extravasation confirms the integrity of the closure

Perineal Repair

The perineal approach involves a 2-step procedure which is more morbid than a transvaginal repair. Perineal repair is used primarily for perineal fistulas, which many times involve the anal sphincter. First, a catheter is inserted into the fistula and the overlying tissue is incised creating a perineoproctotomy. The fistula tract

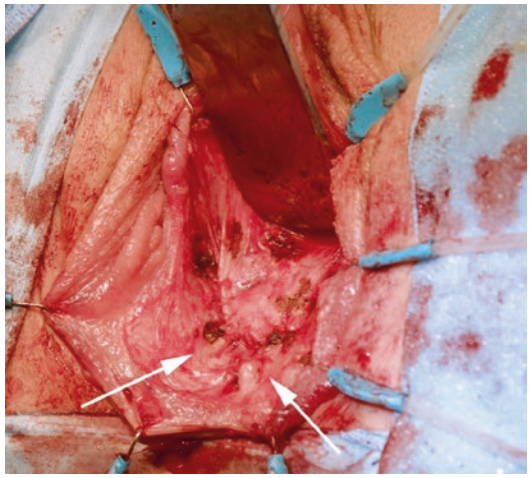

Fig. 10.27 The flap of prerectal fascia previously developed is advanced distally to cover the area of the fistula repair

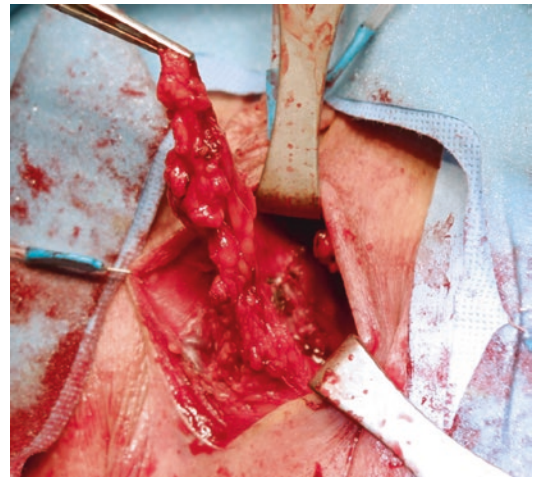

Fig. 10.29 The superior pedicle of the Martius flap is tied and cut anterior to the pubic bone to allow mobilization of the flap

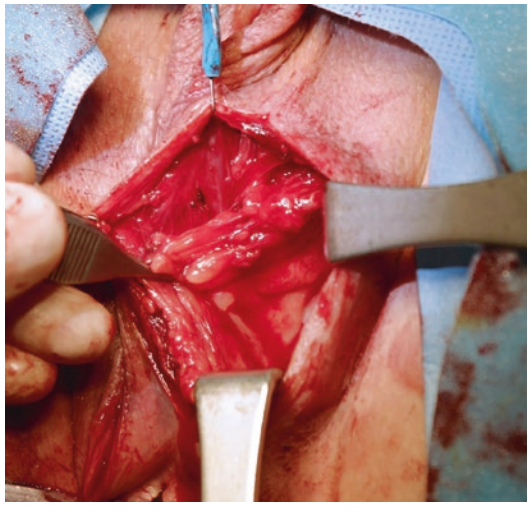

Fig. 10.28 A Martius flap is created using a vertical incision in the left labia majora. The inferior pedicle of the flap is preserved

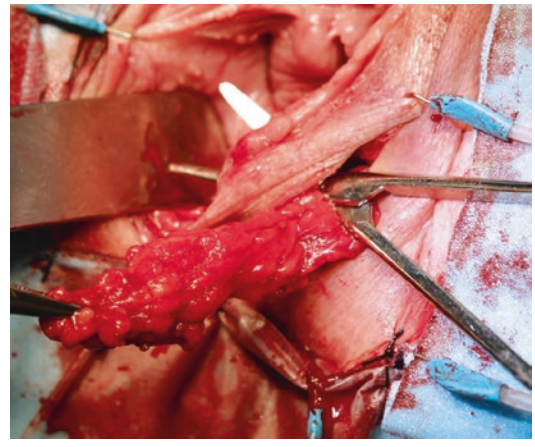

Fig. 10.30 A tunnel under the labia is created toward the anterior rectal wall

can be excised and then the layers that were divided are approximated without tension. The vaginal and rectal mucosa are separated and closed in 2 layers. The second step is a sphincteroplasty and rebuilding of the perineal body. The internal and external sphincters are approximated and the perineal body is rebuilt.

In our experience, we perform adjuvant procedures to improve the repair by making the incision asymmetric and excising only the epithelium so the subcutaneous fat can be crossed over and interposed to provide an additional layer.

Complications

Complications of hematoma and infection increase the risk of recurrence of the fistula.

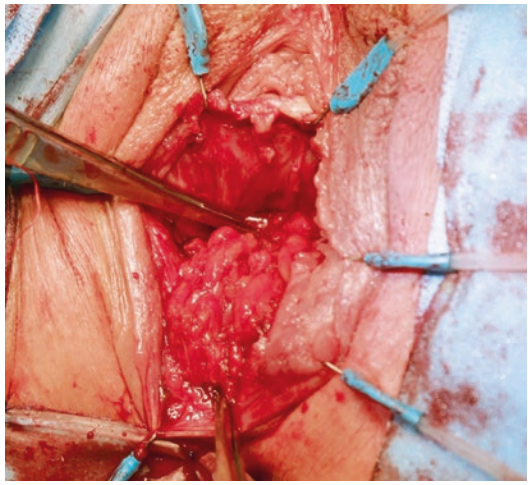

Fig. 10.31 The Martius flap is transferred to the vaginal canal and placed over the anterior rectal wall. The flap should provide coverage to the area 3 cm around the closed fistulous tract. Interrupted, delayed absorbable sutures are used to secure the flap in place

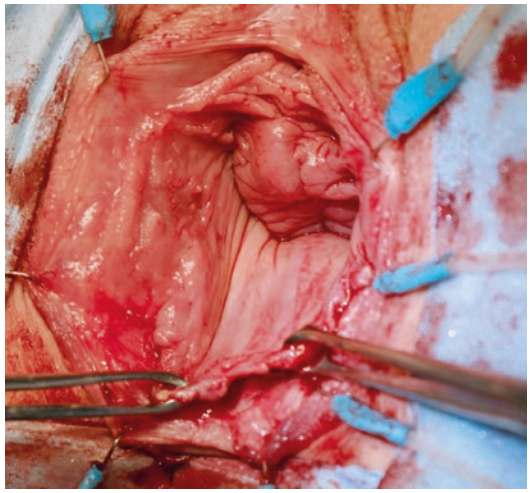

Fig. 10.32 The flap of posterior vaginal wall is advanced distally to provide new tissue coverage to the site of the fistula closure

Preoperative broad coverage antibiotics are given in an attempt to prevent infections. In cases of recurrent fistula, the patient should have a fecal diversion before exploration and repair. The repair should include interposition of tissue. Additional causes of RVF recurrence include foreign bodies or non-absorbable sutures used in the repair, recurrence of malignancy or IBD, poor tissue quality, inflammation, ischemia, dead space that was not obliterated during the initial repair, and significant constipation [100].

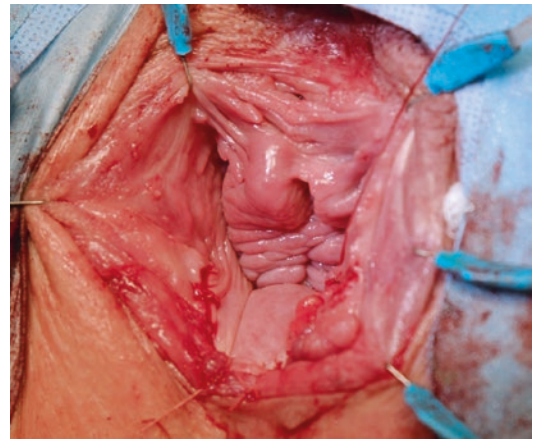

Fig. 10.33 A final image of the closure of a rectovaginal fistula using a Martius flap

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