Rectourethral Fistula: Operative Technique and Outcomes

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Abstract

Purpose of Review Rectourethral fistula (RUF) is an infrequent yet distressing pathology that can lead to significant complications for patients. Its management has been debated over the years and physicians have yet to reach a consensus on RUF treatment. In this review, we outline the status of the current literature on RUF from the initial diagnosis to the outcomes, complications, and surgical techniques available for RUF repair.

Recent Findings Higher rates of success are achieved on the first surgical attempt. Therefore, when deciding which surgical procedure to use, it is of vital importance to consider both patient characteristics (such as identifying if the fistula is simple or complex) and surgeon-related factors. Overall, many of the papers published reported good outcomes with several surgical techniques. However, most of the reports in the literature are retrospective in nature, reporting only small series with limited statistical merit. Through our analysis of the varying surgical techniques, we were able to identify the following suggestions: Conservative management should be performed with both urinary and fecal diversion, especially for simple fistulas. The transanal approach is an alternative approach for use in small simple fistulas as well as sealant glues. The transperineal approach has shown great results for complex fistulas in some series, but it also increases the risk for stress urinary incontinence. In some cases, the transsphincteric approach has been linked to fecal incontinence. Finally, the transabdominal approach in a robotic fashion may be a reliable technique. However, physicians must consider the high cost and the danger of invasion of the peritoneum before its use.

Summary As of yet there is still not enough evidence to determine which surgical techniques are best for the varying scenarios of RUF. However, one point remains true for every RUF case: surgical repairs should only be done by an expert, after proper patient selection, and with the intention of both achieving success in the first repair. In order to advance our understanding of RUF occurrences and treatment, larger prospective and randomized studies are needed.

Keywords Rectourethral · Rectourethral · Fistula · Robotics · Transperineal · Transanal · Conservative

Introduction

Rectourethral fistula (RUF) is an uncommon pathology characterized by a connection between the epithelium of the urethra and the rectum [1]. RUF can lead to significant complications such as abscesses, urinary tract infections, necrotizing fasciitis, osteomyelitis, or sepsis [2, 3••].

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According to their etiology, RUF can be congenital, iatrogenic, traumatic, neoplastic, or inflammatory (i.e., Crohn's disease) [4, 5].

Factors that predispose patients to RUF include advanced age, poor nutritional status, diabetes, renal failure, immunosuppression, prior radiation/energy treatments, or previous transurethral resection of the prostate [6–8].

In the past, RUF cases have been linked to prostatic surgical procedures like open simple prostatectomies, urethral dilations, or transurethral resections of the prostate.

However, more recently, increasing use of focal treatment modalities for prostate cancer such as high-intensity focused ultrasound (HIFU), brachytherapy (BT), and external beam radiotherapy (EBRT) has increased the rate of RUF cases [3••].

Data shows that RUF after BT and EBRT varies between 0.3 and 3% and between 0 and 0.6%, respectively [6, 7]. RUF cases as a complication of HIFU have been reported to be between 1.1 and 2.2% [8, 9] (Fig. 1).

Rectourethral fistulas after radical prostatectomy are extremely unusual as opposed to the more common presentation of rectovesical fistulas with an incidence of 1% after rectal injury during radical prostatectomy.

Physicians tend to mislabel rectovesical fistulas as RUF when they occur after radical prostatectomies (RP). Fistulas after RP usually develop between the rectum and the bladder neck, not the urethra. This clarification is relevant not only for nomenclature purposes but also for management planning [1•] (Fig. 2).

Another risk factor to consider regarding the causes of RUF is the use of neoadjuvant treatments for patients with rectal cancer. Neoadjuvant chemoradiation may increase the incidence of inadvertent injuries to the posterior wall of the prostate, thereby predisposing patients to postoperative RUF [9, 10].

Clinically, RUF cases are classified as simple and complex. Complex fistulas are those in which one or more of the following criteria are present: fistula size larger than 2 cm, the presence of urethral strictures, bladder neck contracture, and/or previous energy treatments [10] (Fig. 1).

Fistula classification is an important factor in determining appropriate treatment options, given the fact that complex fistulas represent a significant therapeutic challenge due to their increased recurrence rates.

Rectourinary fistulas have been in the medical field for centuries. They were initially described by Rufus of Ephesus in 200 A.D., yet, advancements have stalled due to the limitations of the studies published on the subject.

Most of the reports are small retrospective studies with very heterogeneous surgical approaches and protocols. As a result, there is still no standardized surgical or management approach [10, 11].
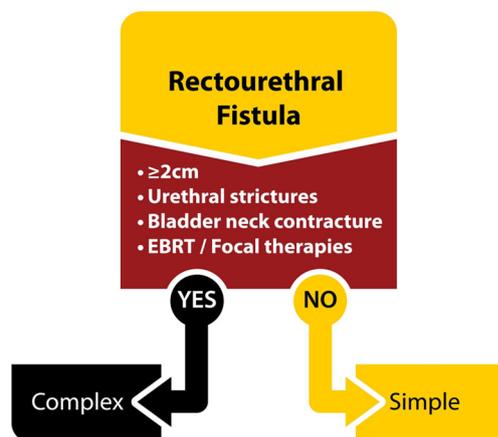

Fig. 1 Classification criteria for RUF. RUF can be classified as simple or complex
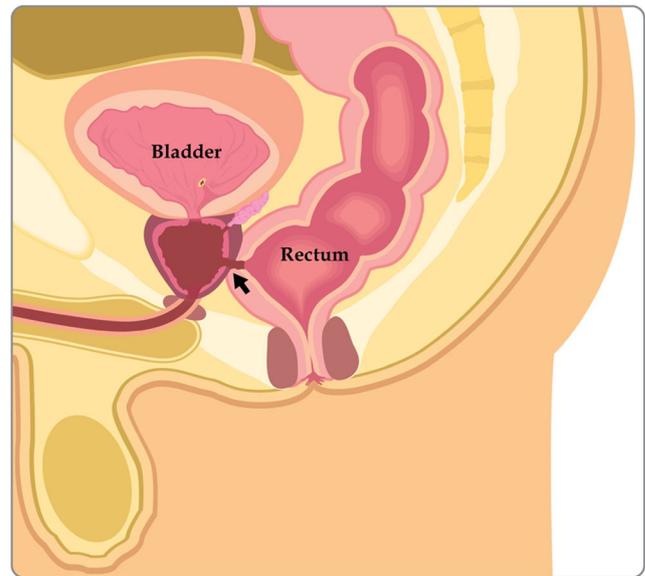

Fig. 2 Graphic representation of a rectourethral fistula. Fistulas after radical prostatectomies are usually between the rectum and the bladder, not the urethra. Arrow points out the fistulous tract

In this review, we will describe the current status of the literature for the RUF diagnosis and the different surgical techniques available for RUF management.

Diagnosis

A thorough interrogation, a high clinical suspicion, and an appropriate physical exam are crucial for diagnosis and management planning. Patients will initially present with recurrent urinary tract infections, dysuria, abdominal pain, leakage of urine per rectum, pneumaturia, and, in severe cases, fecaluria [10, 12•].

On the physical exam, the anterior rectal wall defect and the fistulous tract may be palpated during digital rectal examination. Cystoscopy and proctoscopy aid in identifying the tract and the characteristics of the surrounding tissues (i.e., inflammation or ischemic tissue). If there is a previous malignancy in that anatomical location, biopsy of the area could be needed to identify possible recurrences.

Voiding cystourethrography or retrograde urethrography can identify and delineate the anatomic location and size of the tract. Radiologic evaluation with CT scans or MRI has also proven to be instrumental both in defining the anatomical relations of the fistula with other organs and in identifying concomitant colorectal, urethral, or bladder pathology. Upper urinary imaging is also recommended to rule out concomitant ureteral injury [13].

Lastly, urinary control, fecal continence, and baseline nutritional status should be assessed to have a functional baseline to work with during the postoperative period and to promote efficient postop recovery.

These factors, together with the performance status, should also be taken into consideration when choosing the type of approach to be used [11, 12•].

Management

Nowadays, the management of RUF remains a controversial subject in the field of reconstructive surgery. Most studies stress the importance of individualizing each case based on the complexity of the fistula and patient-specific characteristics. As previously mentioned, current RUF surgical treatment plans are driven by surgeons' preferences and training expertise.

Conservative Management

The conservative management strategy consists of driving urine and feces outside of the fistulous tract without surgical excision of the tract or the defect. It consists of a low-residue diet, urethral catheterization, suprapubic cystostomy, nephrostomy, ileostomy, and/or colostomy placement. Some authors advocate this approach as it can allow the fistula to heal by itself. Others are firmly against it due to low success rates [12•, 13].

If conservative treatment is not successful by the twelfth week, it is not recommended to continue this treatment modality because after this time frame, the fistulous tract will persist due to epithelization of it.

Conservative treatment can aid in slowing down the progression of symptoms, in avoiding the development of infections, and in closure of the defect. It can be used as a first-line treatment or adjuvant to the surgical repair [3••].

Some literature recommends driving the urine and the feces at the same time to maximize the chances for successful treatment [4]. However, at present, there is no consensus on the indications for this modality nor is there a clear guideline on how conservative the approach should be.

In a series presented by Nyam et al., the role of fecal diversion was not clearly shown. They reported a fistula recurrence rate of 85.7% after initial management with colostomy [14].

On the other hand, Thomas et al. presented a retrospective series of 13 patients treated with conservative treatment strategies. They categorized them into three groups: the first with a transurethral catheter and fully absorbable diet for at least 4 weeks, the second with patients with colostomy and a transurethral catheter, and a third group with patients who underwent immediate surgical closure without colostomy.

Spontaneous closure was seen in 100% and 33% of the cases for groups 1 and 2, respectively. Immediate surgical repair without a concomitant colostomy was carried out in only one patient and recurred. These results favor the use of protective colostomy in all cases and suggest that spontaneous closure under conservative management with a transurethral catheter may be an option in patients with simple fistulas [15].

Surgical Management

Surgical management is usually indicated for complex fistulas or after conservative measures have failed. A vast number of techniques have been developed over the years without any agreement on if certain techniques are preferred over others. Surgical experience and technical expertise play the most important (if not the only) role in the decision-making process [11, 12•].

Transperineal

The first report of a RUF repair using transperineal surgery was published in 1904. Transperineal access to the RUF has the advantages of better exposure to the urethra and the rectum, as well as easy access to the distal urethra. In addition, this access facilitates the performance of a simultaneous repair of urethral pathology such as urethral strictures [4, 11, 13, 16].

Various interposition flaps can be used with the transperineal approach, such as the gracilis muscle, pediculated dartos muscle, scrotal myocutaneous, levator ani muscle, gluteus maximus, or the buccal mucosa. However, the gracilis muscle flap approach has established itself, standing as the most frequently selected flap among surgeons (used in 75% of the cases) due to its excellent vascular supply, unmatched mobility with minimal morbidity from the donor site, and capacity to harvest regardless of age. Flaps can be harvested from the patient's own tissue (autologous), from other donors (allograft), or even from other species (heterologous).

It is important to point out that autologous flaps have been associated with different complications such as infection, wound dehiscence, hematomas, thigh pain, and leg numbness, the latter two being more specific to gracilis flap [5, 12•, 13, 17•, 18]. To overcome this, the use of heterologous flaps has recently been explored as an avenue for identifying potential advantages such as less surgical invasion, shorter operative times, and reduction in overall morbidity. However, there is not enough evidence to support this revolutionary technique yet [19].

Overall, muscle flap interposition can increase success rates, promoting healing by serving as a barrier between the two organs and, given the fact that it is a radiation-free tissue, by adding extra blood supply (Fig. 3) [4, 11, 12•, 13].

Despite the above advantages, the limited space of the working field makes the muscle flap interposition difficult to perform.

Lastly, the transperineal technique is also associated with stress urinary incontinence and bladder neck contractures [4, 13]. Heckenbleiker et al. reported gracilis flap success rates of
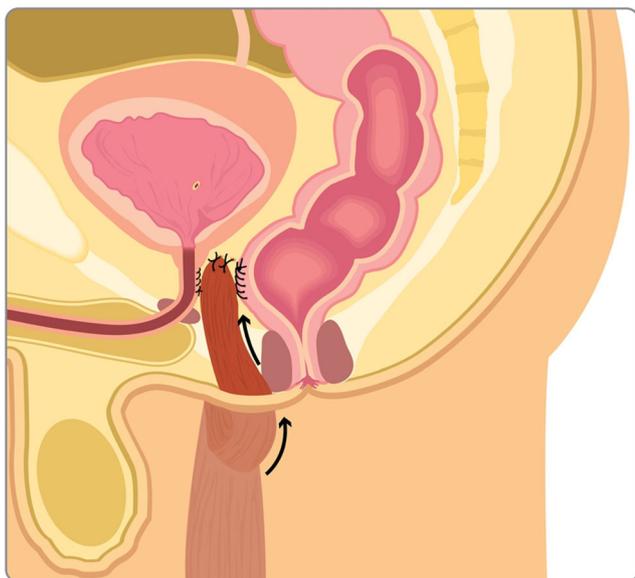
Fig. 3 Graphic representation of a rectourethral fistula repair using a transperineal approach with interposition of a gracilis muscle flap

91% and a frequency of use of 75% [11]. Overall, success rates for the transperineal technique vary between 75 and 100% with different types of flap [20].

Transanal

This method was first introduced by Jones et al. in 1987 [21]. This technique is used for small simple fistulas (< 4 cm) located in the distal rectum [4].

This technique was proposed based on some theoretical advantages such as less scarring on the area of the fistula, decreased wound infection rates, reduced postoperative pain, shorter recovery time, and the possibility of less fibrosis around the fistulous tract in cases where further procedures are necessary.

On the other hand, the limited exposure and lack of access to the urinary tract are its primary disadvantages. The fistulous tract cannot be excised which can predispose a patient to fistula recurrence [4]. It is important to note that the flow of urine usually occurs from the urinary system towards the rectum because the urinary tract is a high-pressure system. Therefore, not closing the tract or the urethral defect represents a fundamental setback for this technique.

There are three methods for transanal repairs reported in the literature: the Latzko technique, transanal endoscopic microsurgery (TEM), and transanal minimal invasive surgery (TMIS).

In 1999, the Latzko technique was described by Razi et al. in a retrospective series of 5 patients between 1999 and 2006 with a 100% rate of success over a median follow-up period of 44 months. Razi et al. promote the use of this technique as a

primary procedure due to its technical simplicity and the high success rate of the procedure [22].

TEM was described by Bochove-Overgaauw et al. as a more favorable technique in patients with minimal trauma and fibrosis. The technique offers an alternative to minimal invasive procedures and, importantly, preserves the neurovascular bundles and anal sphincter, and does not cause fecal incontinence. However, there are no large randomized trials that support this finding. Bochove-Overgaauw et al. reported 2 cases with a 50% rate of success [23].

Nicita et al. reported 12 RUF patients who were successfully treated with TMIS. However, none of these fistulas occurred after radiation and the fistula sizes were less than 1.5 cm [13, 24].

Transsphincteric

Kilpatrick and Mason reported the first transsphincteric case in 1969, also known as the York-Mason procedure [25].

This technique avoids the manipulation of the lateral pelvic and pararectal spaces, providing certain advantages such as sexual potency preservation, urinary continence, and rectal innervation. Traditionally, the minimally invasive technique has often been preferred because of its lack of significant morbidity. However, this procedure relies only on tissue present immediately surrounding the fistula, which makes this technique not suited for patients with a history of radiation-induced or recurrent fistulas [26]. Additionally, this technique has lost favor over the past years due to increasing rates of fecal incontinence [16].

Some authors report higher rates of fecal incontinence, wound dehiscence, and fecal fistula. Other authors like Gupta et al. have proposed that fecal incontinence can be avoided if a careful tagging of the sphincteric muscle components is done for further restoration. Lastly, authors like Dafnis have reported an association between diabetes, smoking, and preoperative radiation in unsuccessful cases using this technique. Yet, the same predictors may apply to other surgical methods as well [5, 11, 27•].

The success rate reported by several authors using the York Mason approach hangs around 88–100% [27•].

Transabdominal

One of the advantages of these repairs is the possibility of using omentum, peritoneum, or neurovascular bundles as tissue for interposition. It use has been particularly advocated in oncological patients where an extensive dissection is needed in addition to the fistula repair. Also, if necessary, a colostomy or cystostomy can be performed simultaneously.

Open transabdominal surgery via the abdomen usually involves greater morbidity, a more extended recovery period, poor exposure, and difficult instrumentation deep into the

pelvis. The latter can be particularly challenging in patients who have undergone prior abdominal surgery [5].

Laparoscopic surgery is a minimally invasive option that provides better visualization and overcomes some of the disadvantages of open surgery by shortening the recovery period, thus decreasing the postoperative morbidity, and it facilitates better exposure and instrumentation in the pelvic area. However, the procedure is technically demanding and requires surgical mastery of complex maneuvers such as intracorporeal suturing and knotting [1•, 10, 28].

Robot-assisted surgery shares the same benefits as minimally invasive surgery yet it overcomes some of the limitations of laparoscopic surgery by adding greater dexterity, a tridimensional view, and the procedure has a shorter surgical learning curve [1•, 10]. The big disadvantage is the high economic cost.

The robotic repair of RUF consists of four main steps: (1) a robotic prostatectomy, (2) closure of the rectal defect, (3) tissue interposition (neurovascular bundles or omentum), and (4) the performance of a vesicourethral anastomosis (VUA). Sometimes, completing a VUA without tension is not feasible because the widespread affectation of the surrounding tissues requires an excessive dissection of the membranous urethra (especially in cases associated with radiotherapy or focal treatments for prostate cancer). When a VUA cannot be carried out, several management options are available. These options include perineal urethral mobilization, complete bladder closure with placement of a suprapubic tube, a catheterizable stoma, or a transverse ileal tube. Finally, for severe cases, a cystoprostatectomy with ileal conduit can be undertaken as a last therapeutic resource (Fig. 4).
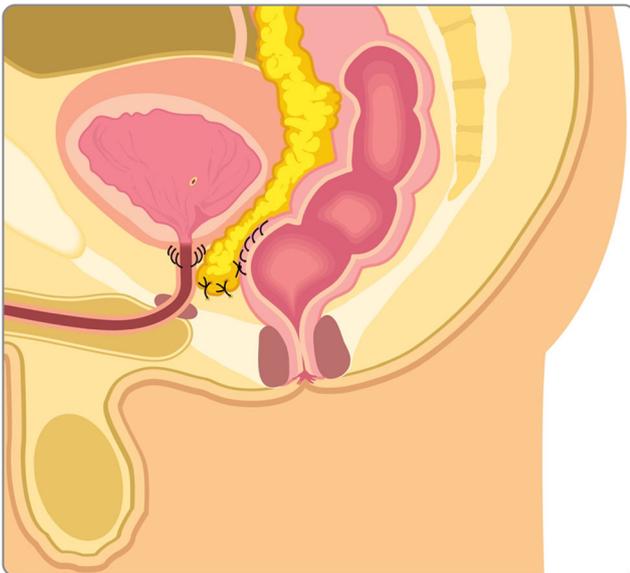

Fig. 4 Graphic representation of a rectourethral fistula repair using a transabdominal approach with interposition of an omentum flap

Transabdominal approaches done in a minimally invasive fashion have shown success rates of more than 95% [28, 29]. Some authors argue that this type of procedure should be the treatment of choice for complex RUF. The transabdominal approach is only considered in cases where previous attempts have failed. Nevertheless, it is critical to recognize that the best success rates are achieved in the first surgical attempt [30, 31]. Therefore, we should not save efforts in solving complex fistulas during the first attempt given the frustration and distress that this situation poses on patients and because it is harder for subsequent attempts to be successful.

Novel Techniques Using Sealant Glues

The use of hemostatic agents such as fibrin glue has been explored recently for the management of RUF by stimulating fibroblast migration, and proliferation in the area, hence, passively occluding the defect due to fibrin deposit and scar formation. The success rates reported with this technique have been around 30–80% [32, 33]. Two other cases in the literature used cyanoacrylate glue on rectovesical fistulas with good results. Patrlj et al. reported a comparative series of 69 patients in which they compared outcomes based on the fistulous tract length (more or less than 3.5 cm). Surprisingly, they showed that the results are better for fistulas that are > 3.5 cm (noting recurrence rates of 10 vs 26%). Other authors have argued that this may be due to the difficulty for the sealant to stay in place in short tracts rather than in long ones [34]. The advantages of this technique include increased safety, low cost, and feasibility under local anesthesia. Yet, larger more comprehensive studies are needed to validate these promising results [35, 36].

Conclusion

RUF are complex clinical and surgical scenarios. Several techniques and protocols for the management of this pathology have been proposed. Notwithstanding, no consensus has been met to guide the management of RUF. Surgical treatment requires highly proficient surgeons and expertise. More studies are needed to increase the level of evidence of the literature.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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