Rectourethral and Complex Fistulas: Evaluation and Management

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Key Concepts

- Rectourethral fistula (RUF) is an uncommon but potentially devastating condition which may significantly impact a patient's quality of life.
- Treatment of prostate cancer is most common etiology.
- Up to 45% of simple RUF may heal with fecal diversion alone.
- Ultimate repair may be quite complex, involving a multispecialty team approach over the course of several procedures.
- Surgical repair with interposition of well-vascularized tissue has good outcomes, though radiation confers higher risk for permanent fecal or urinary diversion.

Introduction

Rectourethral fistula (RUF) is an uncommon but potentially devastating condition which may significantly impact a patient's quality of life. Ultimate repair may be quite complex, involving a multispecialty team approach over the course of several procedures. This chapter discusses acquired rectourethral fistulas in adults; congenital RUFs which are typically found and treated in the neonatal period are not covered in this chapter.

Etiology

The vast majority of acquired RUF are iatrogenic following treatment of prostate cancer, which is more frequently multimodal than in past years. Inflammatory bowel disease and pelvic infections may also cause primary RUF, though far less frequently. Traumatic pelvic injuries from vehicular trauma, other trauma with pelvic fracture, or battle-related instances may also lead to RUF. Kucera reported three soldiers with complex penetrating perineal injuries who required RUF repair in a staged manner over several months, illustrating the complex nature of these injuries and their management [1].

RUF complicates radical retropubic prostatectomy in 1–6% of cases, regardless of whether the procedure was performed open, laparoscopically, or robotically. The prostatic urethra is separated from the anterior rectal wall only by Denonvilliers' fascia and capsule of the prostate, making it vulnerable to damage and fistulization. Many of these RUFs result from unrecognized rectal injury or failed rectal repair at the index operation and typically occur at the vesicourethral anastomosis. The incidence of rectal injury at prostatectomy has been reported from 0.1% to 9% [2, 3]. In one review, 54% of patients who developed an RUF had an overt rectal injury. Other non-ablative risk factors for RUF include age, prior transurethral resection of the prostate, bacterial prostatitis, previous hormonal therapy, and a perineal operative approach [4].

The addition of radiation to the treatment of prostate cancer contributes significantly to RUF formation. Ionizing radiation leads to microvascular injury, mucosal ischemia, and tissue fibrosis. Prior to 1997, less than 4% of RUF had received radiation; from 1998 to 2012, more than 50% involved some form of radiotherapy [5]. When used as stand-alone primary therapy, the rate of RUF for external beam radiotherapy (EBRT) is about 1%, and, for brachytherapy, about 3% [6, 7]. Combining the two modalities increases the risk regardless of the order or isotopes employed. The rate of RUF after newer modalities such as cryosurgery and high-intensity focused ultrasound (HIFU) is around 2% currently [8].

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The incidence and complexity of RUF increase markedly during salvage therapy for a biologically or histologically confirmed prostate cancer recurrence after EBRT. Regardless of the salvage method employed – prostatectomy, cryosurgery, HIFU, or BT – rates of RUF range from 3% to 6% to as high as 60% [9–11]. These RUFs are among the most complex, with large fibrotic connections in a field of poor-quality tissue. Concomitant urethral and rectal strictures as well as sexual and urinary dysfunction are common [5].

Iatrogenic RUF may also occur following low rectal resections for rectal cancer or salvage resections for anal cancer; these patients have often also received pelvic radiation. Secondary rectal cancer following EBRT is a concern, occurring 5–15 years posttreatment [12]. Rectal biopsies, especially anteriorly, may be the final precipitating event in the formation of RUF and should be performed with great care in this situation [13]. Other elective rectal and anal surgeries can rarely lead to RUF, including fistulotomy and stapled hemorrhoidopexy. [14]

Clinical Presentation

RUFs due to a complication of prostatectomy typically present with the first 2–4 weeks after surgery [15]. Radiation-associated RUF can present up to 14 years after the last radiotherapy dose, supporting the role of long-standing tissue damage in these patients. Patients with RUF may present with fecaluria, pneumaturia, and pelvic or bladder pain. The passage of urine per rectum on attempted urination is often reported. Recurrent urinary tract infections are common. In one series, over 80% had preexisting erectile dysfunction [16].

Diagnostic Evaluation

Physical examination will often reveal a defect in the anterior rectal wall 5 to 6 cm from the anal verge. Direct visualization of the tract with cystoscopy and colonoscopy will help establish the location and size of the fistula and the quality of the surrounding tissues and allows for biopsy of any areas suspicious for recurrent malignancy. Voiding cystourethrography or gastrograffin enema may yield additional information. Axial imaging and computed tomography or magnetic resonance imaging are useful adjuncts, especially when other modalities are equivocal [4]. If possible, the functional status of the urinary system should be assessed with a urodynamic evaluation. Those with severe underlying incontinence or voiding dysfunction are unlikely to see significant improvement after RUF repair and may be better served by permanent urinary diversion [17].

Classification

Rivera et al. have proposed this classification system for RUF, based on location, size, and patient history, to help guide treatment decisions and standardize reporting [18]. Not all authors have adopted this schema.

- Stage 1 – <4 cm from the anal verge, nonirradiated
- Stage 2 – >4 cm from the anal verge, nonirradiated
- Stage 3 – <2-cm-diameter fistula regardless of distance in a patient with prior radiation
- Stage 4 – >2-cm-diameter fistula regardless of distance in a patient with prior radiation
- Stage 5 – ischial decubitus fistula

Most other authors separate RUF into simple and complex fistulas. Simple RUFs are small (<1 cm), nonirradiated, with minimal symptoms, no associated sepsis, and no previous repair attempt. Complex RUFs are larger (>1 cm), with other complicating factors that may include previous radiation or cryotherapy, urethral stricture, sepsis, or previous failed repair.

Management of Rectourethral Fistula

Management of rectourethral fistula (RUF) depends on the fistula size and etiology, as well as the familiarity of the managing team with a particular approach. If a neoplasm is the cause of the RUF, management of the neoplasm must take precedence. Similarly, in the setting of Crohn's disease, medical management must be optimized before any attempt is made to intervene on the fistula. Readers are directed to the chapters on these entities for further information.

RUF is best managed with a multidisciplinary team including a colorectal surgeon, a urologist, and often a reconstructive/plastic surgeon. When the initial assessment has been completed, patients fall into one of two groups: simple or complex RUF. It is important to remember that a significant number of patients with RUF may heal without surgical intervention. A spontaneous closure rate of 14–46% was reported after fecal diversion alone [19], and some patients with a small RUF will heal with urethral catheter drainage alone [2]. Figure 14.1 shows an algorithm for assessment and management of RUF [19].

Many RUFs identified following laparoscopic or robotic prostatectomy are classified as simple [2]. Initial manage-

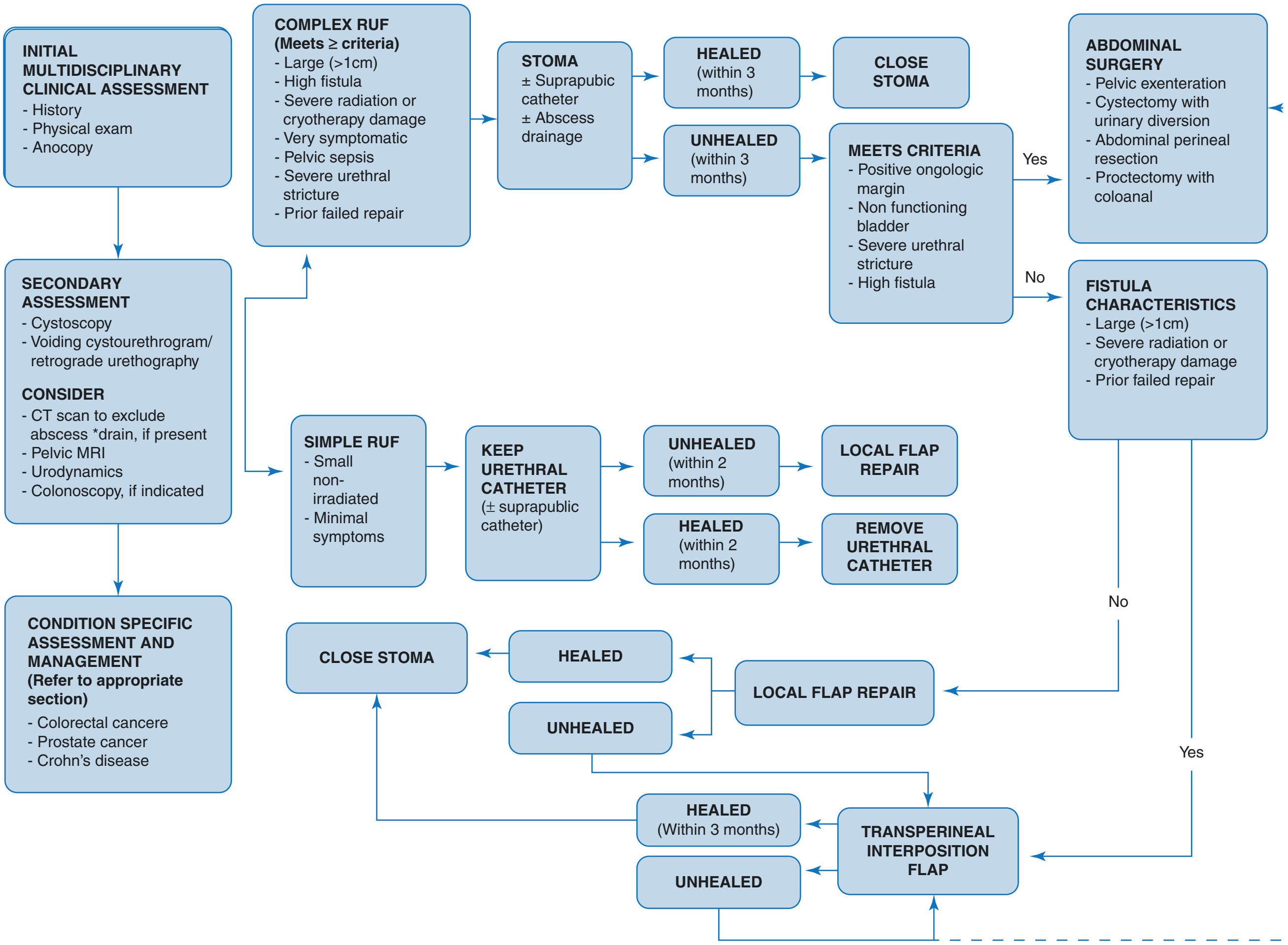

Fig. 14.1 RUF management algorithm. (Reproduced with permission from ASCRS Textbook of Colon and Rectal Surgery, third edition)

ment consists of urinary catheter drainage for 2–3 months. If the fistula heals, the catheter is simply removed. If the fistula has not healed, a local flap repair is indicated. A transanal flap is a good option in this situation, and fecal diversion is not required. If the local flap repair fails to heal, fecal diversion should be done. If the fistula remains unhealed after 2–3 months of fecal diversion, repair should be accomplished by either repeat local flap repair or transperineal repair approach with an interposition flap of gracilis or dartos muscle.

RUFs following external traumatic injury are most often complex [1]. These situations are managed initially with fecal diversion and often suprapubic bladder drainage to minimize fistula symptoms. Abdominopelvic imaging should be obtained to assess for pelvic abscess; if present, drainage is indicated. Most algorithms call for reassessment of the fistula after 3 months of fecal diversion/bladder drainage. Both endoscopic and imaging assessment is recommended, with evaluation of healing from both the rectal and urinary sides. If healing has occurred, the stoma is closed.

If the RUF remains unhealed after fecal diversion, and the patient is a poor operative candidate or refuses further surgery, permanent diversion is an option to manage symptoms. For those patients desiring definitive management, several options exist. For patients with positive oncologic margins after prostatectomy, a nonfunctioning bladder, or other intrapelvic complications, an abdominal approach should be considered. Rectal salvage may be possible in some cases. Otherwise, a transperineal or transanal approach is most commonly employed. A posterior (parasacral or transsphincteric) approach may also be utilized, though this is used less commonly now for reasons that will be discussed. Other techniques, such as puborectalis flap or large endoscopic clip closure, have been described in the literature with small numbers of patients and short follow-up.

Transanal Approach

Transanal repair with an endorectal advancement flap is a good option for a simple RUF. Absence of anal or rectal stricture is a prerequisite; fecal diversion is not required. The technical details of the flap itself have been aptly described in the chapter on anal fistula (see Chap. 15); TEM platform can also be used to perform the procedure. The flap is outlined and mobilized as usual. The fistula is identified and divided, and the rectal wall is dissected away from the urethra sufficiently to provide exposure. The opening into the urethra is debrided of any granulation tissue. Small fistulas rarely require augmentation of the urethra. Pliable normal tissue such as pararectal fat, if available, can be approximated over the urethral opening of the fistula with interrupted 3–0 absorbable suture; polyglactin (Vicryl) is ideal. Some authors advocate introduction of a biologic mesh into the space between the rectal wall and the urethra; if used, this is parachuted in and secured with further 3–0 absorbable sutures (Fig. 14.2). The endorectal advancement flap is then brought into place and secured with interrupted 3–0 polyglactin sutures. The urethral catheter is maintained for 4–6 weeks before assessing fistula healing.

Transperineal Approach

Transperineal is the preferred approach for RUFs that require interposition of healthy, well-vascularized tissue. Successful closure rates are approximately 90% regardless of radiation or ablative therapy history. This technique allows good exposure for low and mid-rectal RUFs. For low, small RUFs, a

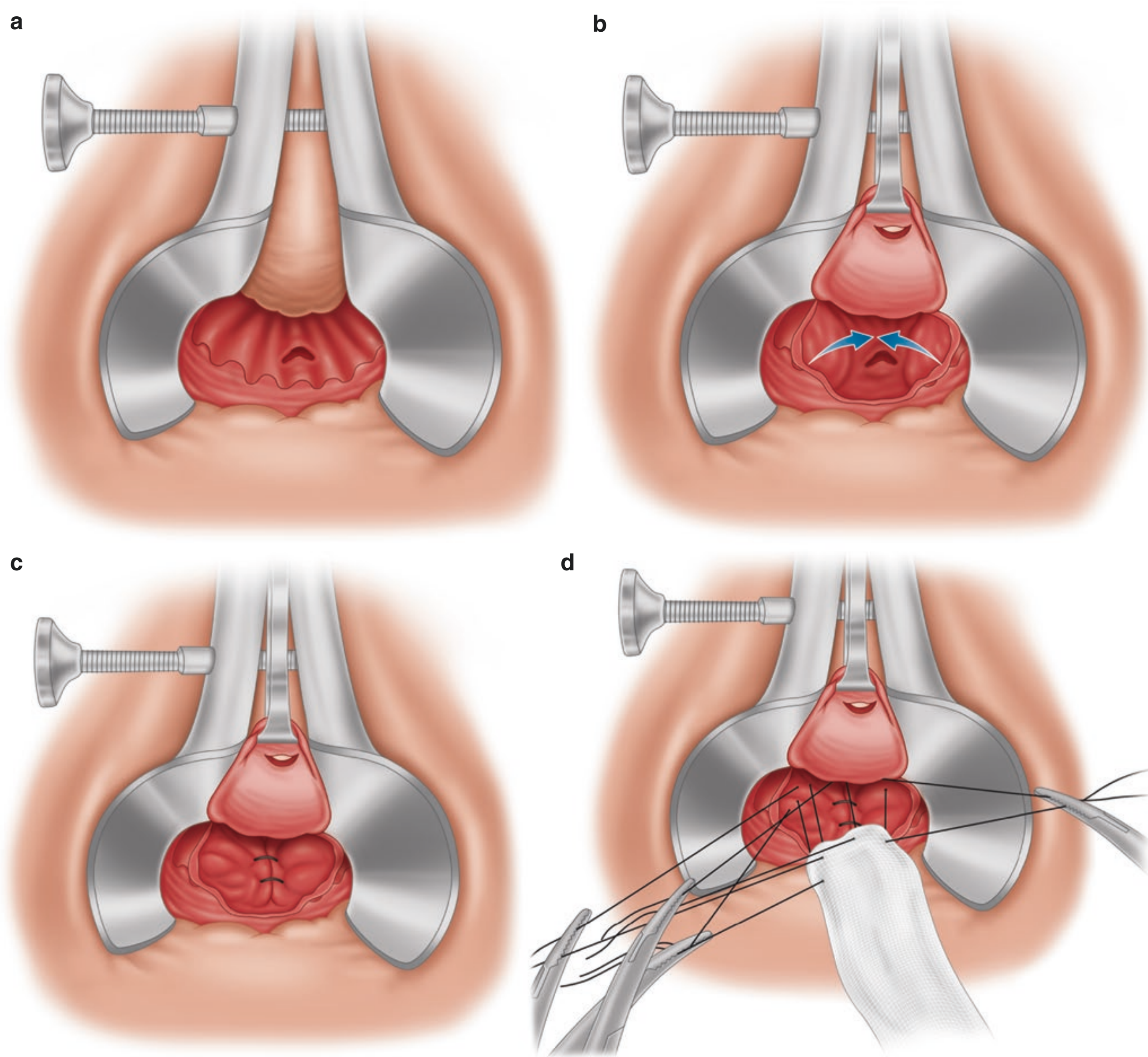

Fig. 14.2 Transanal endorectal advancement flap buttressed with biologic mesh interposition. (Reproduced with permission from ASCRS Textbook of Colon and Rectal Surgery, third edition)

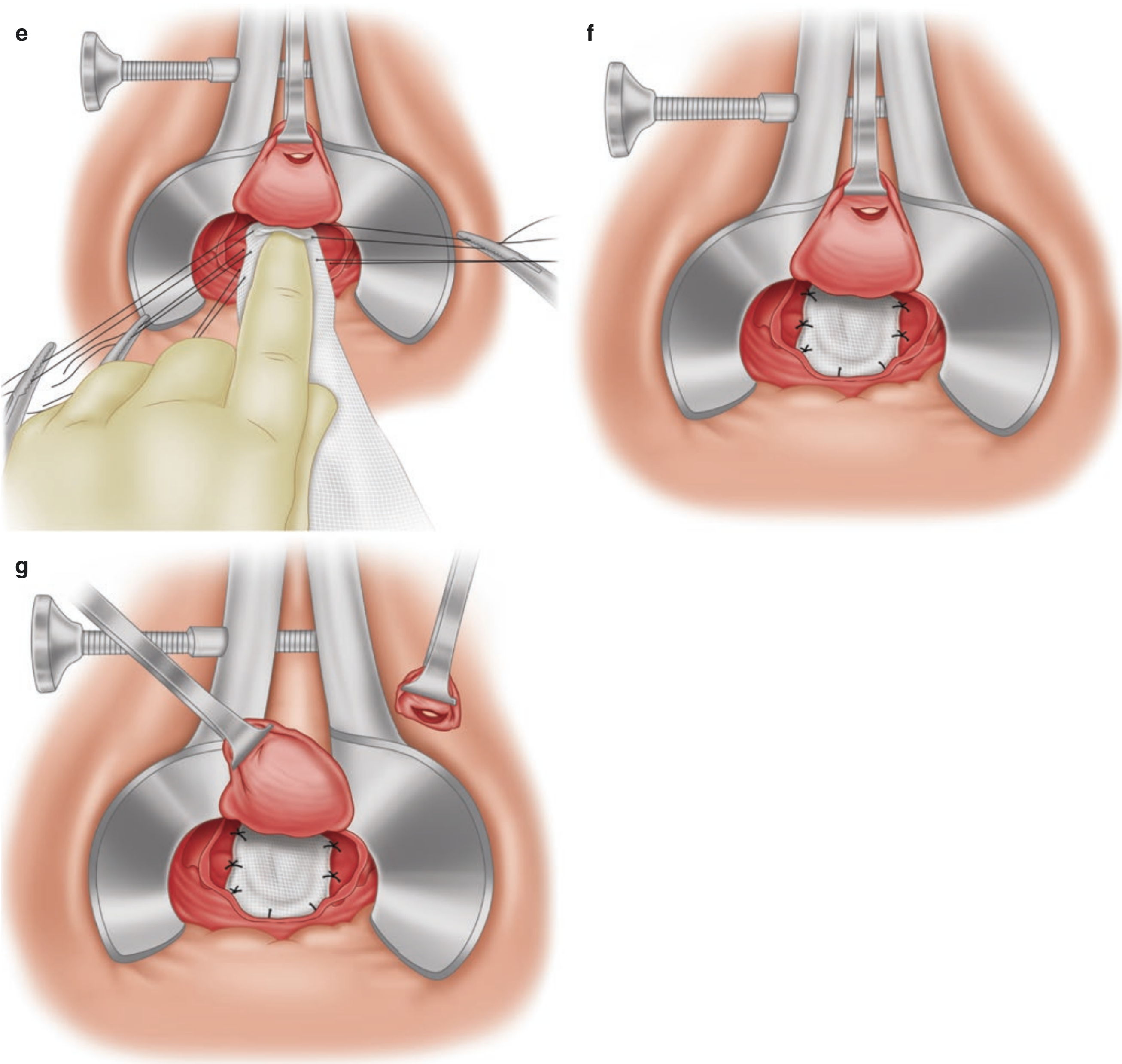

Fig. 14.2 (continued)

dartos muscle flap provides adequate tissue bulk with good reach. The entire operation is performed with the patient in prone jackknife position with excellent exposure. A U-shaped incision is made starting laterally on the perineum, extending onto the posterior scrotum and back up to the opposite side of the perineum (Fig. 14.3). The incision is carried down through the dermis and dartos muscle. This flap is dissected off the testicular tissue, progressively freeing the flap posteriorly to the transperineal edges of the skin incision. Dissection now proceeds into the rectoprostatic plane, anterior to the anal sphincters. The fistula is identified and separated; dissection proceeds another 3–4 cm cephalad. Adequacy of the urethral tissue is assessed; the urethra may be augmented with buccal mucosa [20] or biologic mesh at this point if indicated. Urethral closure is accomplished with 3–0 absorbable suture. Bladder may be imbricated over the closure if possible. Closure of the rectal defect is then performed with 3–0 absorbable suture; horizontal closure is preferred to minimize possible narrowing of the rectal lumen.

The skin is removed from the Dartos flap up to the transperineal incision. The flap is rotated upward into the dissected space. Sutures are placed into the flap edges, and the flap is parachuted into the dissected space with guidance to cover the entire dissection bed. Additional sutures are used to secure the

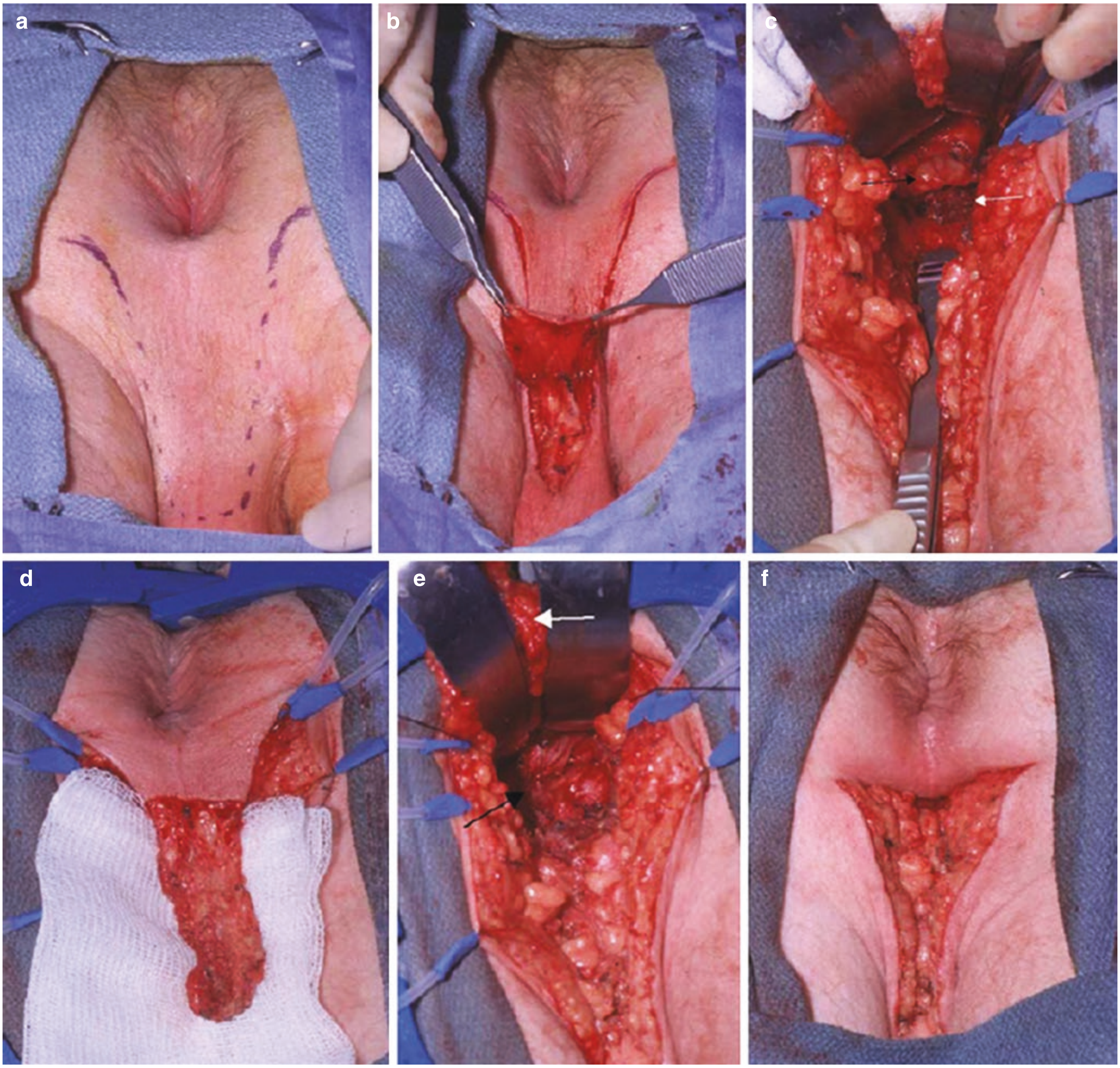

Fig. 14.3 Dartos flap repair. (**a**) Marking of proposed flap. (**b**) Incision has been made; Dartos flap with skin intact is being lifted. (**c**) View of completed repair of fistula openings in rectum and urethra. Solid black arrow points to rectal mucosa. Solid white arrow points to urethral repair. (**d**) Dartos flap denuded of skin in preparation for placement between the fistula repair sites. (**e**) Tacking sutures are placed adjacent to the rectal and urethral repairs; these will be used to parachute the flap deep into the space between the rectum and urethra and secure the flap. (**f**) Completed dartos repair with soft tissue of perineum coapted. (Reproduced with permission from Varma et al. [21]. Copyright © 2007 Wolters Kluwer)

flap as needed. The wound is then closed in layers over a small drain. Varma et al. reported on eight patients managed with a dartos flap. Half had undergone a previous repair attempt; all had fecal diversion and either urethral or suprapubic urinary diversion as well. Six healed without complication. Of the two failed repairs, one had previous radiation for prostate cancer, and the other had a history of HIV [21].

A gracilis flap is preferable for larger, higher, or radiated RUFs. The harvest of the gracilis flap may be performed in lithotomy or prone position, depending on surgeon preference. The gracilis muscle is traced externally about 4 cm posterior to the adductor muscle (Fig. 14.4a). Three small longitudinal incisions are made over the muscle's course; Penrose drains are placed around the muscle at each of these

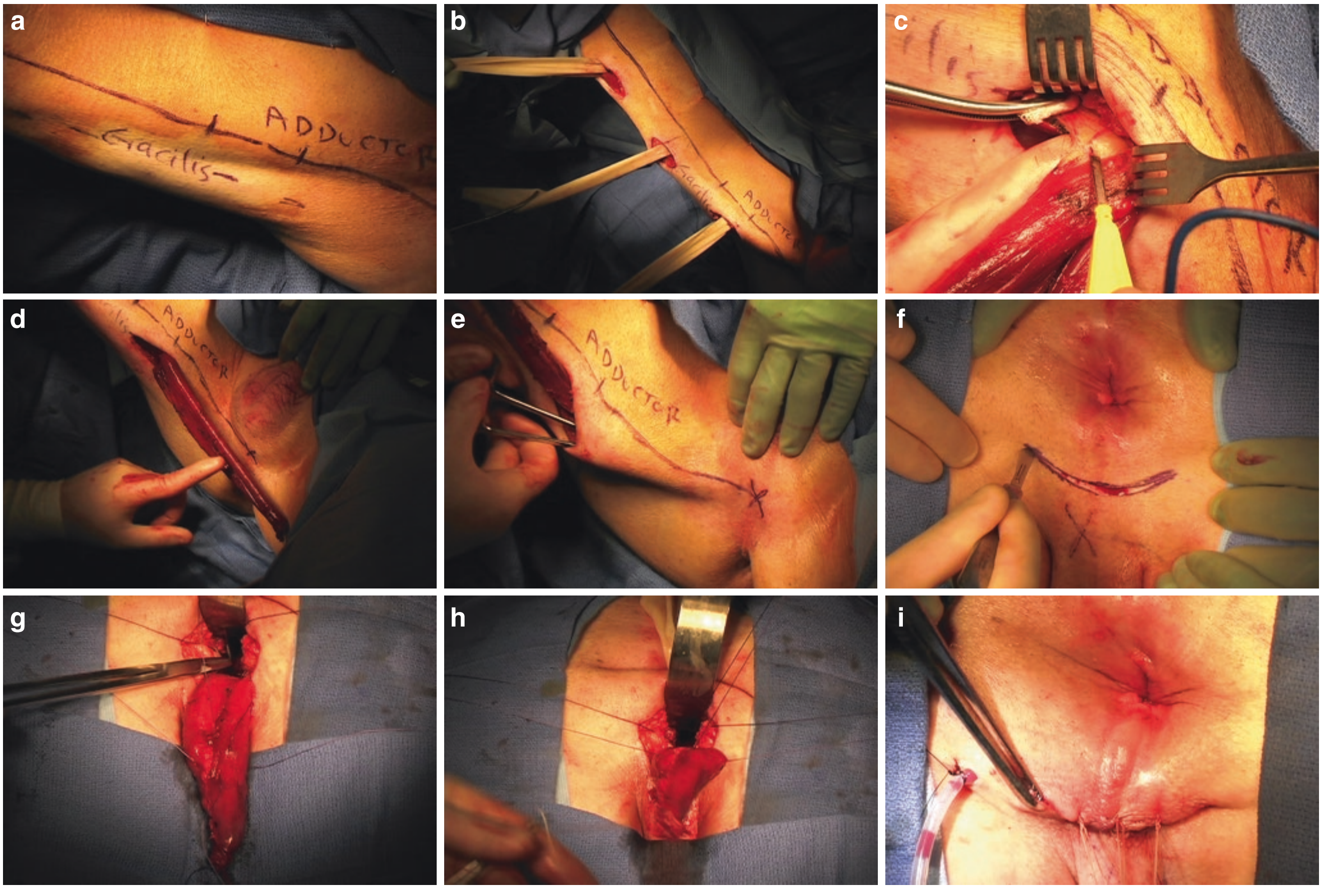

Fig. 14.4 Intraoperative pictures of gracilis muscle interposition flap for transperineal repair of rectourethral fistula. (Special thanks to G.A. Santoro and M.A. Abbas)

sites (Fig. 14.4b). The distal insertion at the medial aspect of the knee is disconnected, and the gracilis muscle is dissected off of surrounding tissue from distal to proximal. Small perforators from the superficial femoral vessels are clipped and divided. Care is taken to preserve the major neurovascular bundle which is typically located within 10 cm of the pubic symphysis (Fig. 14.4c). The freed portion of the muscle is exteriorized through the most proximal skin incision and rotated to ensure adequate length for perineal coverage (Fig. 14.4d). A large clamp is used to create a subcutaneous passage to tunnel the flap from the medial thigh into the *perineum* (Fig. 14.4e). The thigh incisions are closed over a small drain. If performed in lithotomy, the patient is then turned to prone jackknife position. The perineal dissection proceeds as outlined above (Fig. 14.4f). The gracilis flap is parachuted into the dissected perineal space as described above (Fig, 14.4g, h). If the muscle bulk is excessive, it may be carefully tailored. Additional sutures are placed to secure the flap as needed; the incision is closed in layers over a drain (Fig. 14.4i).

Posterior Approach

Posterior approaches have been used for years to manage RUFs. The overall success rate, about 88%, is similar to that of the transperineal approach, but most of the data on posterior approaches has come from nonirradiated patients. The use of these approach has decreased significantly over that last 15 years, in part because fistulas are now generally more complex and due to other issues such as limited exposure, inability to manage urethral stricture or bladder neck issues concurrently, and limited use of interposition flap. The York-Mason technique proceeds by posterior sagittal division of the anal sphincters, levators, and posterior rectal wall, exposing the anterior rectal wall and the fistula. The fistula is divided; urethral and then rectal walls are repaired. The incision is then closed in layers, reapproximating the rectal wall and each muscle layer meticulously. Major complications include rectocutaneous fistula and sphincter compromise. The Kraske technique uses a parasacral incision, coccygeal resection, and division of the anococcygeal ligament to expose the posterior rectal wall. The posterior rectal wall is opened to provide exposure of the anterior rectal wall and the fistula. Fistula repair proceeds as outlined above. The proctotomy is closed, and the remainder of the incision is closed in layers over a drain.

Posterior approaches are used much less frequently today. Currently, transperineal approach with tissue interposition is favored for most complex RUFs. Patients with RUFs considered too high to approach transperineally, or with other intrapelvic issues, are best managed with a transabdominal or combined approach.

Transabdominal Approach

This approach is best suited for RUF patients with concomitant complex intrapelvic problems which cannot be adequately addressed with a perineal or posterior approach. Patients with positive oncologic margins after prostatectomy require a transabdominal approach for definitive management. Other complex situations such as nonfunctional bladder, strictured urethra, and previous failed repair attempt may also fall into this category. The approach and planned operation are tailored to patient and disease factors. Options include cystectomy and urinary diversion with rectal repair, proctectomy with coloanal anastomosis, abdominoperineal resection, and pelvic exenteration.

Rectal preservation vs. need for proctectomy must be carefully considered; a second attempt at low pelvic dissection and repair carries a much higher risk for failure than the initial attempt. If the rectal tissue is healthy, the fistula is not overly large, and healthy tissue can be obtained for interposition, then repair with omentum or rectus interposition may be a good choice. The urinary procedure should be accomplished first. Primary repair of the rectal wall follows. Omentum is mobilized, preserving the left gastroepiploic artery as a main blood supply. Sutures are placed to parachute the flap into position anterior to the rectal repair. Additional sutures are placed as needed to secure the flap into place. Rectus abdominis flap may also be used, with reconstructive surgery colleagues as co-surgeons.

If the rectal defect is too large for primary closure and tissue quality is poor, proctectomy with or without coloanal anastomosis is indicated. Dissection is carried down to the levator muscles to reach below the fistula. The rectum can be divided with a stapler, and a stapled coloanal anastomosis can be performed. For a very low fistula, mucosectomy or intersphincteric dissection from below may be needed to complete the dissection, with a handsewn anastomosis performed for intestinal continuity. If sphincter preservation is not indicated, the stump of rectum or anal canal can be left in place and an end colostomy performed, avoiding the morbidity of a perineal incision. If, however, there is an indication for a formal abdominoperineal resection, that can be performed.

Other Approaches

Reports of other approaches with small patient numbers appear with some regularity in the surgical literature. Solomon et al. reported on four RUF patients (one with history of radiation, one with Crohn's) in whom a bilateral puborectalis interposition was used via a transperineal repair approach. The puborectalis muscle is exposed bilaterally, mobilized as a 1-cm-wide strip, and released posteriorly at the level of the anorectal junction. The muscle strips are rotated medially and superiorly and overlapped to cover the closed fistula openings. Each muscle flap is stitched into place with absorbable suture; the wound is closed over a drain. All fistulas were healed at median 8 months' follow-up [22]. The smaller size of the available muscle limits this approach somewhat. Anecdotal reports of fibrin glue abound, usually as a low-risk attempt in a poor surgical candidate. Similarly, case reports of fistula cauterization and large over-the-scope-clips also appear; reported follow-up is short. These approaches have not entered the mainstream of RUF management.

Outcomes of RUF Repair

The outcome of RUF repair is variable. There is wide variation in patient populations and techniques, and patient selection clearly plays a role. Nearly all reports are series, with no randomized controlled trials due to the rarity of this problem. The reported overall fistula closure rate after repair is 68–100%. However, closure of intestinal or urinary diversion is significantly less likely in radiated patients.

The transanal approach is safe and effective in small, low (by definition nonradiated) RUFs. Garofalo et al. reported on 12 patients with RUF who underwent rectal advancement flap closure. Primary healing was accomplished in 67% (8/12 patients). Two of the four recurrences underwent a second successful repair for a final success rate of 83% [23].

The transperineal approach with muscle interposition is currently the procedure of choice for complex RUFs which do not have concomitant intrapelvic complications. While good results have been reported using a dartos flap with 75% healing [21], the flap used most commonly is the gracilis muscle. A large systematic review reported postoperative RUF healing in nonradiated and radiated patients at essentially the same rate (89% vs. 90%). However, permanent fecal diversion in radiated patients was 25% compared to 4% in nonradiated patients. Similarly, permanent urinary diversion was 42% in radiated vs. 4% in nonradiated patients. The initial closure rate with a transperineal approach was 90%; the flap most commonly used was the gracilis [24].

Kaufman et al. reported on a series of 98 patients with RUF who underwent transperineal repair with interposition muscle flap; 49 were nonradiation induced and 49 were radiation or ablation induced. At median follow-up of 14.5 months (range 3–144), 98% of nonradiated RUF were healed after one procedure, compared to 86% of radiated RUF. Gastrointestinal continuity was restored in 94% of nonradiated RUF and 65% of radiated RUF [25].

Tran reported on seven patients, six with radiation history, treated with transperineal fistula repair and gracilis flap interposition (three patients had been previously excluded due to large fistula size). All seven had fecal diversion while five had urinary diversion as well. At 11 months' mean follow-up, all had healed; three had fecal continuity restored, one was awaiting stoma closure, and three had permanent fecal diversion. Five had stress urinary incontinence and two were awaiting artificial urinary sphincter insertion. There was no morbidity related to the gracilis harvest [26]. Hampson et al. reported on 21 patients with RUF; all underwent transperineal repair and all but 1 had a muscle interposition (19 gracilis, 1 of which was bilateral; and 1 rectus flap). Initial success was 95% with mean follow-up of 2.6 years. Thirty-day morbidity was 19%. Fifteen patients were evaluable for long-term telephone follow-up; 53% reported perineal pain, and 43% reported residual problems related to the gracilis harvest [16].

A series from Cleveland Clinic of gracilis flaps employed in a variety of complex fistula repairs included 36 men with RUF, mainly secondary to treatment of prostate cancer. Thirteen of these had undergone previous failed repair attempts. Initial fistula closure rate was 78%, but postoperative complication rate was 47%. Eight patients who failed underwent a subsequent repair attempt which raised the overall healing rate to 97% in this series [27].

It is clear that patient selection leads to improved outcomes. In a series of nine patients with nonradiated RUF, all with a previous failed repair attempt, all were successfully managed with transperineal fistula division and gracilis interposition graft [28]. All but one had fecal continuity restored; none reported fecal dysfunction or difficulty walking related to the gracilis harvest. A small series from India reported outcomes of six patients with RUF resulting from trauma (2), prostatectomy for benign hypertrophy (2), and open radical prostatectomy (2), none with history of radiation. All were managed with transperineal fistula division, buccal augmentation of urethra, rectal repair, and gracilis interposition flap with 100% healing after mean 27 months' follow-up [29].

Outcomes after York-Mason approach for RUF reflect much the same: Adding a muscle interposition improves healing and radiation is associated with poorer outcome [30]. An Italian series of 14 nonradiated patients with RUF managed over 20 years with York-Mason approach reported that all healed successfully with the exception of the single patient with Crohn's who suffered RUF recurrence after 11 years. Eleven (79%) had diverting stomas closed [15].

Dafnis reported on 20 consecutive patients with RUF managed by York-Mason approach between 2002 and 2016. Initial repair was successful in 90% (18 patients), 1 with a dartos interposition; diabetes, smoking, and irradiation history were associated with failure [31]. Van der Doelen et al. reported results of 28 patients who underwent York-Mason repair for RUF between 2008 and 2018. Initial overall success rate was 64%; ultimate overall success rate was 75%. The ultimate success rate in nonirradiated patients was 89%, vs. 50% in radiated. Outcomes after radiation were much improved by use of a gracilis interposition: 100% healing (3/3 patients) with graciloplasty vs. 29% (2/7) without [32].

Conclusion

Adult-acquired RUF is a complex and relatively rare condition. The most common etiology is multimodality management of prostate cancer, though management of rectal cancer and traumatic injury can also result in complex RUF. Population data studies will be required to assess whether the use of multimodality treatment for prostate cancer is related to an increase in the incidence of RUF. Simple RUFs have good outcomes with diversion alone or local flap management without fecal diversion. More complex RUFs require a multidisciplinary approach. Repair of the fistula is most often managed with a transperineal approach utilizing a muscle interposition flap for best outcome. Other complex and recurrent fistulas may also be managed with an algorithm similar to the one proposed here: fistula definition, fecal and urinary diversion as deemed necessary, and repair with interposition of normal, well-vascularized tissue. There are no data to support higher closure rate with fecal diversion; performance is based on surgeon preference and clinical reasoning. Fecal diversion should be considered in large complex RUF with persistent symptoms affecting quality of life and individuals with medical comorbidities that increase risk of infectious complications and the sequelae thereof. Some authors have suggested performance of a diverting loop ileostomy at the time of RUF closure due to its relative ease of performance and closure. Ileostomy also leaves the colon fallow should a more extensive procedure such as proctectomy with low anastomosis be required. Patients who have had radiation continue to experience higher risk of repair failure, as well as higher risk that fecal and urinary diversion will be permanent. It is also important to note that complications related to gracilis harvest, the most common flap used, are not inconsequential.

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