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VOIDING DYSFUNCTION EVALUATION (C GOMEZ, SECTION EDITOR)

# Evaluation and Management of Rectourethral Fistulas After Prostate Cancer Treatment

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**Abstract** Most men newly diagnosed with prostate cancer will undergo local treatment with prostatectomy, radiation, or tissue ablation. A small percentage of these men will develop a rectourethral fistula, a complicated disease that requires a multidisciplinary approach to management. Diagnosis is typically made with a careful history and physical exam with endoscopy and select imaging recommended in all patients. Fistulas resulting from prostatectomy, radiation, or tissue ablative technology are approached differently due to local tissue changes following therapy. Post-radiation and thermal ablation fistulas have a lower fistula closure rate due to the deleterious effect of the primary treatment on local tissue. It is imperative that the patient understands the complexity of treatment and sets reasonable goals for treatment.

**Keywords** Urinary fistula · Rectal fistula · Prostate cancer · Rectourethral fistula

## Introduction

Nearly 240,000 men were diagnosed with prostate cancer in 2013 [1]. An estimated 77 % of those newly diagnosed will undergo local treatment of their disease [2]. Although rare, rectourethral fistula (RUF) is a feared complication of prostate cancer treatment due to the significant effect on quality of life as well as the challenging nature of surgical repair [3]. The risk of RUF after primary treatment of prostate cancer is <2 % following prostatectomy, external beam radiotherapy (XRT), or brachytherapy with increasing rates seen after salvage or combination therapy [4–6].

An individualized, multidisciplinary approach is frequently needed involving the uro-oncologist, colo-rectal surgeon, and genitourinary reconstructive surgeon. Sufficient time should be invested in discussing the nature of the problem and management options with the patient to set realistic expectations. In this review, we will discuss the diagnosis and management of RUF resulting from treatment of prostate cancer.

## Diagnosis and Evaluation

A detailed history, physical exam, endoscopy, and review of imaging are essential for operative planning. The most common symptom of RUF is rectal passage of urine and watery stools, present in 90 % of patients. Urinary incontinence, pneumaturia, voiding symptoms, and fecaluria are also common, occurring in up to 60 % of cases [7]. A digital rectal exam should be performed as the fistulous os may be palpated and rectal tone can be assessed. The presence of significant pain should also be noted. Cystoscopy should be done to evaluate for urethral stricture, bladder neck stenosis, necrosis, and location of fistula. Proctoscopy should evaluate for stenosis, ulceration, rectal tone, and location of fistula. Imaging should include cystourethrography and magnetic resonance imaging (MRI) to evaluate the extent of soft tissue damage following radiation or ablative therapy such as cryoablation or high-intensity focused ultrasound (HIFU). Barium enema can

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also be done to detail the location of the fistula if it is unclear on cystourethrogram.

## Management Options

When considering management options for RUF, it must be determined whether the patient is eligible for a trial of non-surgical management. In highly selected patients with pinpoint-sized RUF, discovered early after prostatectomy or cryotherapy in the absence of prior pelvic radiation, sepsis, or pelvic abscess, we consider an initial trial of conservative management. These patients often have a history consistent with RUF with no evidence of fistula on physical exam or endoscopy. However, radiographic findings confirm or are suggestive of a RUF. Non-surgical management can last an indefinite time period as long as the patient has few symptoms and no sequela from the fistula. The overwhelming majority of men that present to our reconstructive urology practice do not meet the above criteria and are in need of reconstruction or diversion. Albeit, there is a selection bias that exists in our practice as less severe RUFs are usually initially managed by the treating urologic oncologist.

## Non-surgical Management

Non-reconstructive management includes urinary catheter placement with or without bowel diversion and a low-residue diet to avoid bulky stool. This is primarily reserved for three patient groups: those with a pinpoint fistula that may heal spontaneously, those with larger fistulae but mild symptoms who decline surgical treatment, and those who are unfit for reconstructive surgery due to comorbidities. The last group is rare as most patients who were fit for treatment of prostate cancer are able to tolerate surgery. For those who decline surgical intervention, living with mild symptoms is reasonable. This patient should recognize risks of pelvic abscess, osteomyelitis, sepsis, and even necrotizing fasciitis. These are unusual events and typically occur in patients with uncontrolled fistula drainage. The goals for patient care in this group include management of symptoms such as pain, infection, and skin irritation.

The second group includes patients who have early recognition of fistula following prostatectomy or primary cryotherapy. Although unlikely, fistula resolution after urethral catheter placement alone or in addition to bowel diversion has been reported following prostatectomy in the absence of prior pelvic radiation [8, 9]. Early recognition is important as epithelialization of the tract typically occurs within 6 weeks, and once epithelialization occurs, it is less likely the tract will close spontaneously. Reconstruction and fistula closure should be considered if there is persistent fistula seen on imaging or the patient is symptomatic after 2–3 months of catheterization.

## Surgical Management

### Procedure Selection

Due to the infrequency of RUF development following treatment of prostate cancer, there are no randomized studies that compare outcomes between techniques of surgical repair. Surgical repair of RUF is technically challenging which has led to the development of numerous operative techniques. Fistula closure and reconstruction can be accomplished from an abdominoperineal, perineal, transanorectal (posterior sagittal/York-Mason), transsacral, and transanal approach [10•, 11–13, 14•]. There have been reports of robotic-assisted laparoscopic repair; however, this has not been widely adopted [15]. Additionally, there are numerous options for tissue interposition, although omentum or gracilis flaps are most commonly used [16–18].

Table 1 provides a brief overview of different surgical approaches with a summary of advantages and disadvantages of each approach. Deciding which operative approach to take requires careful consideration of patient factors such as body habitus, size of fistula, cancer status, need for flap interposition, and perhaps most importantly the etiology of the fistula. In patients with prior radiation or HIFU, there can be significant compromise of local vascularity with resultant fibrosis and tissue necrosis.

### Fecal Diversion

There is not a clear consensus on the role and type of fecal diversion in management of RUF. As such, the decision to perform colostomy or ileostomy is based on surgeon preference. Most surgeons would recommend immediate fecal diversion with the exception of small non-irradiated fistulas. Diversion is done in effort to avoid infection, pain, sepsis, pelvic abscess, and generally improve quality of life. Additionally, fecal diversion may decrease inflammation in the area of eventual reconstruction. In patients with prior radiation or thermal ablation of the prostate resulting in RUF, diversion is typically done prior to reconstruction. Recently, some have questioned this practice [19•, 14•, 20]. Our practice is to perform fecal diversion in the setting of prior radiation or ablative therapy prior to reconstruction. We recommend end colostomy rather than loop colostomy or ileostomy as it provides the most definitive form of fecal diversion. Arguments against end colostomy are that diversion is more challenging and ostomy reversal following successful reconstruction requires laparotomy and bowel anastomosis. When fecal diversion is necessary due to infectious complications, we prefer to wait a

**Table 1** Surgical approach and outcomes for reconstruction of RUF

| Method of repair<br>Author | No. of post-surgical/ radiation | Percent without RUF recurrence (post-surgery/ radiation) | Comments |
|---|---|---|---|
| Abdominoperineal<br>Lane [13] | 0/6 | na/100 % | -Allows for omental interposition<br>-May require inferior pubectomy for exposure<br>-Risks of transperitoneal approach |
| Perineal<br>Vanni [14•] | 35/39 | 100 %/84 % | -Familiar surgical approach<br>-Gracilis flap interposition easily accessible<br>-Limited exposure |
| Posterior sagittal (York-Mason)<br>Hadley [10•] | 44/7 | 98 %/57 % | -Excellent exposure of fistula tract<br>-Not ideal for post-radiation repair<br>-Difficult to harvest gracilis flap |
| Transsacral (Kraske)<br>Kilpatrick [12] | 6/0 | 100 %/na | -Good exposure of proximal urethra<br>-Few studies in literature<br>-Morbidity of partial coccygectomy |
| Transanal<br>Joshi [11] | 5/0 | 80 %/na | -No division of sphincter, limited morbidity<br>-Limited reports with higher fistula recurrence rates<br>-Not recommended in setting of prior XRT |

*na* not available

minimum of 3 months before proceeding with reconstruction to allow inflammation to decrease. However, we agree with Middleton and others who have shown that RUF repair can be successful in the non-irradiated patient without diversion [21].

## Post-prostatectomy RUF With and Without Prior Radiotherapy

Fistula following prostatectomy occurs most commonly as a result of rectal injury at the time of surgery. Patients undergoing salvage prostatectomy are at increased risk of rectal injury and should be extensively counseled about this complication and prepared for immediate fecal diversion at the time of injury [22]. Most rectal injuries are unrecognized and become symptomatic days to weeks following surgery. The incidence of rectal injury and RUF rates are similar between open, laparoscopic, and robotic-assisted laparoscopic prostatectomy [23]. Repair of post-prostatectomy RUF is most commonly approached from a perineal or posterior sagittal incision [16].

### *Perineal Approach*

Vanni et al. reviewed their perineal approach to non-irradiated ($n$=35) and radiation-/ablation-induced ($n$=39) RUF. At a mean follow-up of 20 months, 100 % of patients in the non-irradiated group achieved fistula closure with a single operation. Repair was done through a transperineal incision with all patients having an interposition flap, most commonly the gracilis muscle (89 %), and pre-operative fecal diversion. Additionally, 97 % of patients in this cohort eventually had the fecal diversion reversed [14•].

In a review of 23 patients with RUF, Voelzke et al. compared results between post-operative ($n$=10) and radiation-induced ($n$=13) RUF. All patients in the post-operative group achieved fistula closure through a transperineal approach, with patients in a jackknife position, with an interposition flap used in 20 % of non-irradiated patients. Eighty percent of patients with post-operative fistula had fecal diversion prior to reconstruction with 7/8 eventually having the diversion reversed [20]. In a similar retrospective review, Mundy et al. compared outcomes of RUF repair in post-surgical and post-irradiation groups. In the 23 patients with post-surgical RUF, all patients had resolution of fistula with a single transperineal operation. The authors elected not to place a diverting colostomy in the six patients in the group who presented without prior diversion. Additionally, after treatment of the first 12 patients, the authors elected not to perform tissue interposition in the following 11. The authors concluded that in the absence of prior radiation, tissue interposition and fecal diversion is typically unnecessary when experienced surgeons perform reconstruction. We agree with the above authors that the perineal approach is the most versatile approach as it allows access to the urethra, endoscopy, flap interposition, and easy conversion to an abdominal approach. Moreover, it is universally familiar to all reconstructive urologists.

### *Posterior Sagittal Approach*

In a single-institution review, Hadley and Middleton reviewed their 40-year experience with repair via a York-Mason type approach. They noted a 98 % fistula closure rate in the absence of prior radiation with three of four failures occurring in patients with prior radiation. No patients developed fecal

incontinence. They concluded that although not absolutely contraindicated, they cautioned against repair of post-radiation fistulas >2 cm from a transanal-transsphincteric (York-Mason) approach [10•]. In fistulae following prostatectomy without prior radiation, we have found the York-Mason approach to be preferable to the perineal approach as it allows excellent visualization of the RUF tract. However, unlike Middleton, we have found it unnecessary to divide the anal sphincter in almost all cases thereby eliminating the risk of fecal incontinence.

## Radiation- and Energy-Induced RUF

Rectourethral fistula is the most common indication for urinary diversion following radiotherapy for prostate cancer [24]. Histologic changes following radiotherapy results in suboptimal tissue quality for surgical repair. Compared to post-surgical RUF, fistula following XRT or brachytherapy is exceptionally challenging, prompting some to recommend urinary diversion in all patients with radiation-induced RUF [25, 26]. In a systematic review of outcomes in acquired RUF, Hechenbleikner reported an overall fistula closure rate of 90 % in the radiation-induced fistula group. The permanent fecal and urine diversion rates in this group were 25 and 43 %, respectively, compared to 4 and 4 %, respectively, in the post-surgical group [16]. There have been several reports of successful repair without permanent urinary and fecal diversion.

Lane and Angermeier reviewed their results with surgical management of RUF following radiotherapy for prostate cancer in 22 patients. Patients with adequate bladder capacity and bowel function were considered candidates for reconstruction without permanent urine and fecal diversion. This approach was successful in 6/6 patients. Five patients underwent repair via an abdominoperineal approach, with the rectal excision and urethral close done in a prone position prior to placement in lithotomy position for colo-anal pull-through, while the other patient had perineal repair. Tissue interposition was accomplished with colonic mesentery placed anteriorly during colonic pull-through. A gracilis flap was utilized in the patient with perineal repair. Fistula closure was successful in all six patients [13]. In the study by Vanni et al. discussed above, successful RUF closure was obtained in 84 % of patients in the radiation/ablation cohort. All patients had repair via a perineal approach with tissue interposition flap and 87 % also requiring buccal mucosal graft closure of the urethral defect. Thirty-one percent required permanent fecal diversion while 10 % required eventual permanent urinary diversion. However, the authors noted

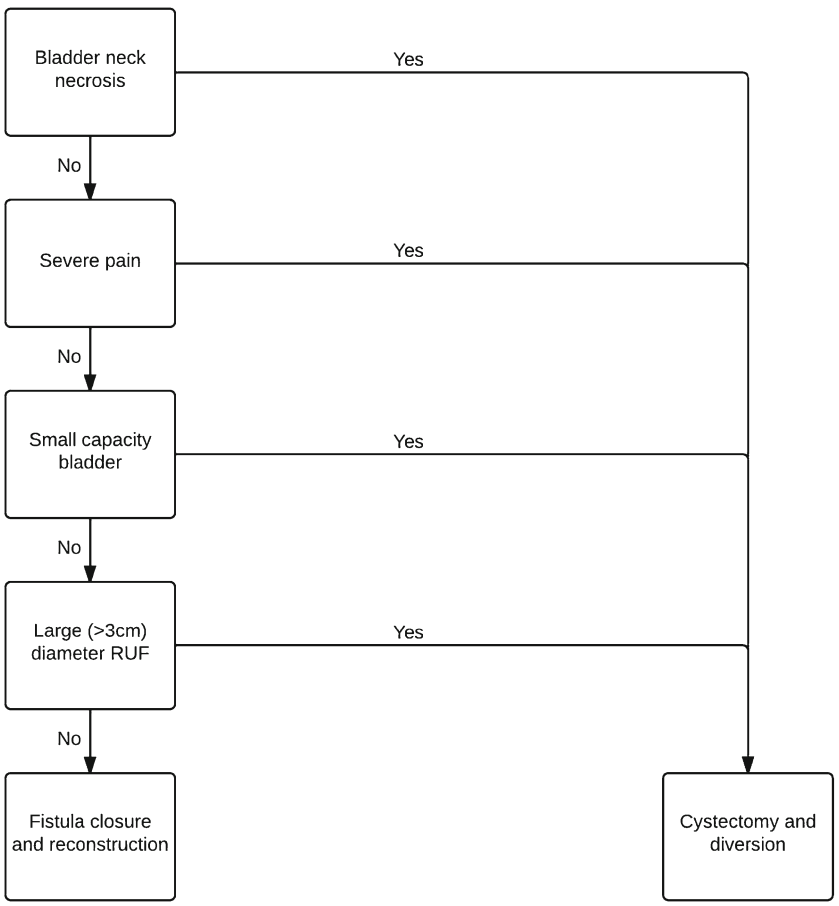


**Fig. 1** Algorithm for determining candidacy for reconstruction in post-radiation/tissue ablation RUF

this was due to radiation cystitis and radionecrosis of the prostate, not recurrence of fistula [14•]. Mundy et al. have reported successful repair of post-radiation RUF in 17/17 patients. If there was a cavitation seen on RUG or MRI, the authors preferred an abdominoperineal approach. In the absence of cavitation, they prefer abdominal approach with concomitant radical prostatectomy. Tissue interposition, most commonly omentum, was used in all patients [19•].

We have had a similar experience as the above authors with post-radiation RUF. No single surgical approach is appropriate for all patients. We agree that the need for flap interposition and temporary diversion is necessary in the overwhelming number of energy-induced RUFs. This patient group is the most challenging to the reconstructive urologist from the surgical as well as the social standpoint as often these men initially elected radiotherapy in hopes of a "less invasive" treatment only to be later faced with multiple complex surgeries. Therefore, we offer reconstruction to only to the highly selected and motivated group of men with radiation-induced RUF (Fig. 1). The size of the fistula and quality of the surrounding tissue are the most limiting factors to successful fistula closure, while bladder capacity, sphincter function, and chronic pain usually determine long-term quality of life and need for additional surgery.

Finally, there have been several reports of fistula repair following tissue ablation of the prostate with HIFU or cryotherapy [27, 28]. In our practice, RUF that develop following thermal ablation are managed similar to post-radiation RUF due to local tissue damage that results from these tissue-ablating technologies. Exam under anesthesia is frequently done to better assess tissue quality in these patients to better determine candidacy for reconstruction.

## Conclusion

Rectourethral fistula following prostate cancer therapy is typically diagnosed with a careful history, physical exam, endoscopy, and imaging. It is prudent to have a multidisciplinary approach to surgical management of this complex and growing problem. Classifying RUF according to etiology, i.e., radiation-/ablation-induced or post-surgical, is essential in surgical planning as well as ensuring that the patient has realistic goals and expectations in treatment of this distressing complication of prostate cancer treatment.

### Compliance with Ethics Guidelines

**Conflict of Interest** Kirk M. Anderson, Maxx Gallegos, Ty T. Higuchi, and Brian J. Flynn 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.

## References

Papers of particular interest, published recently, have been highlighted as:
- • Of importance


1. Siegel R, Naishadham D, Jemal A. Cancer statistics, 2013. CA Cancer J Clin. 2013;63(1):11–30. doi:10.3322/caac.21166.
2. Mahmood U, Levy LB, Nguyen PL, Lee AK, Kuban DA, Hoffman KE. Current clinical presentation and treatment of localized prostate cancer in the United States. J Urol. 2014;192(6):1650–6. doi:10.1016/j.juro.2014.06.017.
3. Lefevre JH, Bretagnol F, Maggiori L, Alves A, Ferron M, Panis Y. Operative results and quality of life after gracilis muscle transposition for recurrent rectovaginal fistula. Dis Colon Rectum. 2009;52(7):1290–5. doi:10.1007/DCR.0b013e3181a74700.
4. Borchers H, Pinkawa M, Donner A, Wolter TP, Pallua N, Eble MJ, et al. Rectourethral fistula following LDR brachytherapy. Urol Int. 2009;82(3):365–6. doi:10.1159/000209374.
5. Mundy AR, Andrich DE. Posterior urethral complications of the treatment of prostate cancer. BJU Int. 2012;110(3):304–25. doi:10.1111/j.1464-410X.2011.10864.x.
6. Kimura M, Mouraviev V, Tsivian M, Mayes JM, Satoh T, Polascik TJ. Current salvage methods for recurrent prostate cancer after failure of primary radiotherapy. BJU Int. 2010;105(2):191–201. doi:10.1111/j.1464-410X.2009.08715.x.
7. Brandes SB, Morey AF. Advanced male urethral and genital reconstructive surgery. New York: Springer; 2013.
8. Thomas C, Jones J, Jager W, Hampel C, Thuroff JW, Gillitzer R. Incidence, clinical symptoms and management of rectourethral fistulas after radical prostatectomy. J Urol. 2010;183(2):608–12. doi:10.1016/j.juro.2009.10.020.
9. Nyam DC, Pemberton JH. Management of iatrogenic rectourethral fistula. Dis Colon Rectum. 1999;42(8):994–7. *discussion 7–9*.
10. • Hadley DA, Southwick A, Middleton RG. York-Mason procedure for repair of recto-urinary fistulae: a 40-year experience. BJU Int. 2012;109(7):1095–8. doi:10.1111/j.1464-410X.2011.10472.x. **Large single center review of York-Mason RUF repair**.
11. Joshi HM, Vimalachandran D, Heath RM, Rooney PS. Management of iatrogenic recto-urethral fistula by transanal rectal flap advancement. Color Dis: Off J Assoc Coloproctol Great Brit Irel. 2011;13(8):918–20. doi:10.1111/j.1463-1318.2010.02278.x.
12. Kilpatrick FR, Thompson HR. Post-operative rectoprostatic fistula and closure by Kraske's approach. Br J Urol. 1962;34:470–4.
13. Lane BR, Stein DE, Remzi FH, Strong SA, Fazio VW, Angermeier KW. Management of radiotherapy induced rectourethral fistula. J Urol. 2006;175(4):1382–7. doi:10.1016/S0022-5347(05)00687-7. *discussion 7–8*.
14. • Vanni AJ, Buckley JC, Zinman LN. Management of surgical and radiation induced rectourethral fistulas with an interposition muscle flap and selective buccal mucosal onlay graft. J Urol. 2010;184(6):2400–4. doi:10.1016/j.juro.2010.08.004. **Large single center review with excellent outcomes**.
15. Linder BJ, Frank I, Dozois EJ, Elliott DS. Robotic transvesical rectourethral fistula repair after a robotic radical prostatectomy. Journal of Endourology. 2013;27(1).
16. Hechenbleikner EM, Buckley JC, Wick EC. Acquired rectourethral fistulas in adults: a systematic review of surgical repair techniques and outcomes. Dis Colon Rectum. 2013;56(3):374–83. doi:10.1097/DCR.0b013e318274dc87.
17. Ryan Jr JA, Beebe HG, Gibbons RP. Gracilis muscle flap for closure of rectourethral fistula. J Urol. 1979;122(1):124–5.

18. Youssef AH, Fath-Alla M, El-Kassaby AW. Perineal subcutaneous dartos pedicled flap as a new technique for repairing urethrorectal fistula. J Urol. 1999;161(5):1498–500.
19.• Mundy AR, Andrich DE. Urorectal fistulae following the treatment of prostate cancer. BJU Int. 2011;107(8):1298–303. doi:10.1111/j.1464-410X.2010.09686.x. **Review of RUF repair at single high-volume center**.
20. Voelzke BB, McAninch JW, Breyer BN, Glass AS, Garcia-Aguilar J. Transperineal management for postoperative and radiation rectourethral fistulas. J Urol. 2013;189(3):966–71. doi:10.1016/j.juro.2012.08.238.
21. Wood TW, Middleton RG. Single-stage transrectal transsphincteric (modified York-Mason) repair of rectourinary fistulas. Urology. 1990;35(1):27–30.
22. Gotto GT, Yunis LH, Vora K, Eastham JA, Scardino PT, Rabbani F. Impact of prior prostate radiation on complications after radical prostatectomy. J Urol. 2010;184(1):136–42. doi:10.1016/j.juro.2010.03.031.
23. Kitamura H, Tsukamoto T. Rectourinary fistula after radical prostatectomy: review of the literature for incidence, etiology, and management. Prostate Cancer. 2011;2011:629105. doi:10.1155/2011/629105.
24. Faris SF, Milam DF, Dmochowski RR, Kaufman MR. Urinary diversions after radiation for prostate cancer: indications and treatment. Urology. 2014;84(3):702–6. doi:10.1016/j.urology.2014.04.023.
25. Beddy D, Poskus T, Umbreit E, Larson DW, Elliott DS, Dozois EJ. Impact of radiotherapy on surgical repair and outcome in patients with rectourethral fistula. Color Dis: Off J Assoc Coloproctol Great Brit Irel. 2013;15(12):1515–20. doi:10.1111/codi.12350.
26. Chrouser KL, Leibovich BC, Sweat SD, Larson DW, Davis BJ, Tran NV, et al. Urinary fistulas following external radiation or permanent brachytherapy for the treatment of prostate cancer. J Urol. 2005;173(6):1953–7. doi:10.1097/01.ju.0000158041.77063.ff.
27. Izawa JI, Ajam K, McGuire E, Scott S, von Eschenbach AC, Skibber J, et al. Major surgery to manage definitively severe complications of salvage cryotherapy for prostate cancer. J Urol. 2000;164(6):1978–81.
28. Netsch C, Bach T, Gross E, Gross AJ. Rectourethral fistula after high-intensity focused ultrasound therapy for prostate cancer and its surgical management. Urology. 2011;77(4):999–1004. doi:10.1016/j.urology.2010.10.028.