Title
Rectourethral Fistulas Secondary to Prostate Cancer Treatment: Management and Outcomes from a Multi-Institutional Combined Experience

Journal
Investigative Urology, 197(1)

ISSN
0021-0005

Authors
Harris, Catherine R
McAninch, Jack W
Mundy, Anthony R
et al.

Publication Date
2017

DOI
10.1016/j.juro.2016.08.080

Peer reviewed

Rectourethral Fistulas Secondary to Prostate Cancer Treatment: Management and Outcomes from a Multi-Institutional Combined Experience

Catherine R. Harris,* Jack W. McAninch, Anthony R. Mundy, Leonard N. Zinman, Gerald H. Jordan, Daniela Andrich, Alex J. Vanni, Ramón Virasoro and Benjamin N. Breyer

Purpose: Rectourethral fistula is a known complication of prostate cancer treatment. Reports in the literature on rectourethral fistula repair technique and outcomes are limited to single institution series. We examined the variations in technique and outcomes of rectourethral fistula repair in a multi-institutional setting.

Materials and Methods: We retrospectively identified patients who underwent rectourethral fistula repair after prostate cancer treatment at 1 of 4 large volume reconstructive urology centers, including University of California-San Francisco, University College London Hospitals, Lahey Clinic and Devine-Jordan Center for Reconstructive Surgery, in a 15-year period. We examined the types of prostate cancer treatment, technical aspects of rectourethral fistula repair and outcomes.

Results: After prostate cancer treatment 201 patients underwent rectourethral fistula repair. The fistula developed in 97 men (48.2%) after radical prostatectomy alone and in 104 (51.8%) who received a form of energy ablation. In the ablation group 84% of patients underwent bowel diversion before rectourethral fistula repair compared to 65% in the prostatectomy group. An interposition flap or graft was placed in 91% and 92% of the 2 groups, respectively. Concomitant bladder neck contracture or urethral stricture developed in 26% of patients in the ablation group and in 14% in the prostatectomy group. Postoperatively the rates of urinary incontinence and complications were higher in the energy ablation group at 35% and 25% vs 16% and 11%, respectively. The ultimate success rate of fistula repair in the energy ablation and radical prostatectomy groups was 87% and 99% with 92% overall success.

Conclusions: Rectourethral fistulas due to prostate cancer therapy can be reconstructed successfully in a high percent of patients. This avoids permanent urinary diversion in these complex cases.

Key Words: urethra, fistula, prostatic neoplasms, prostatectomy, high-intensity focused ultrasound ablation

Abbreviations and Acronyms

HIFU = high intensity focused ultrasound

RP = radical prostatectomy

RUF = rectourethral fistula

Accepted for publication August 8, 2016.

No direct or indirect commercial incentive associated with publishing this article.

The corresponding author certifies that, when applicable, a statement(s) has been included in the manuscript documenting institutional review board, ethics committee or ethical review board study approval; principles of Helsinki Declaration were followed in lieu of formal ethics committee approval; institutional animal care and use committee approval; all human subjects provided written informed consent with guarantees of confidentiality; IRB approved protocol number; animal approved project number.

* Correspondence: Department of Urology, University of California-San Francisco, San Francisco General Hospital, 1001 Potrero Ave., 3A, San Francisco, California 94110 (telephone: 415-640-0120; e-mail: Catherine.Harris@ucsf.edu).

Rectourethral fistula is an uncommon but potentially devastating consequence of prostate cancer treatment, which may result in urinary incontinence, chronic pain and infections.[1] Small surgical fistulas diagnosed early after RP may heal spontaneously with urinary and

0022-5347/17/1971-0191/0
THE JOURNAL OF UROLOGY®

http://dx.doi.org/10.1016/j.juro.2016.08.080
Vol. 197, 191-194, January 2017
Printed in U.S.A.

bowel diversion, although larger or more complex fistulas are often persistent and necessitate surgical repair.[2] Complicating characteristics of fistula include size, concomitant urethral stricture and tissue damage from applied external energy sources such as radiation, cryoablation and HIFU. Some reports describe complex RUFs that were primarily managed by permanent bowel diversion and/or urinary diversion.[3,4]

Several techniques of surgical repair of RUF have been described, including transrectal, perineal, abdominal and combined approaches.[5–8] The use of interposition flaps and grafts such as dartos, gracilis, buccal mucosa and omentum has also been described.[9–11] Success rates of RUF repair vary with published reports limited to single surgeon or institution experience.[6,10,12]

We discuss the management and combined outcomes of RUF after prostate cancer treatment at 4 reconstructive urology centers where there is experience with managing these cases.

MATERIALS AND METHODS

Patients with RUF after prostate cancer treatment were identified at 4 urological reconstructive centers, including University of California-San Francisco, University College London Hospitals, Lahey Clinic and Devine-Jordan Center for Reconstructive Surgery, between 1998 and 2014. Institutional review board approval was obtained at each institution.

RUF was defined as any fistula in the posterior urethra that communicated with the rectum. Patients with a colovesical fistula were excluded from study. Subgroup analysis was performed between patients in whom the fistula developed after prostatectomy and those who received 1 or more energy ablative treatments with brachytherapy, external radiation, cryoablation and HIFU. Patients treated with prostatectomy and 1 or more energy ablative therapy were included in the energy ablative cohort. We defined the success of RUF repair as a fistula repaired without recurrence. Urinary incontinence was defined as patient report of loss of urinary control.

RESULTS

We identified 225 patients with RUF after any prostate cancer treatment at a minimum followup of 6 months. Of these patients 210 (98.3%) underwent surgical fistula repair. Primary permanent urinary diversion was performed in 7 patients (3.3%) and bowel diversion was done in 155 (73.8%).

Surgery was performed with the patient in the lithotomy position and the prone jackknife position in 174 (82.8%) and 36 men (17.1%), respectively. A transperineal approach was used in 166 patients (79%), and a combined abdominal and perineal approach was used in 42 (20%). Sometimes concomitant partial prostatectomy was needed to treat prostatic stenosis. Procedures with the patient prone were done through a perineal incision with the rectum dissected off the urinary side of the fistula and not through a transrectal or York-Mason approach. Muscle flaps such as gracilis, levator, dartos or omentum were used in 193 patients (91.9%).

When stratified by treatment type, 106 patients were in the nonablative radical prostatectomy group and 104 were in the energy ablative group (table 1). Table 2 lists the types of energy ablative treatment. Bowel diversion was performed in 83.6% of cases in the energy ablative group and in 65.0% in the prostatectomy alone group ($p < 0.01$). Muscle flaps and omentum were used at similar rates in the 2 groups. When used in this cohort, a buccal mucosal graft was applied to cover the fistula defect and sewn to the edges of the fistula after the rectum was dissected away and closed. In our series a single investigator performed this in patients who underwent energy ablation.[12] Concomitant bladder neck contracture or urethral stricture was more common in the energy ablative cohort (26.0% vs 14.2% of cases, $p = 0.03$).

Postoperatively urinary incontinence was more common in the energy ablation group at 34.6% vs 16.0% of patients ($p < 0.01$). However, there was no difference in subsequent artificial urinary sphincter placement. Postoperatively the complication rate was 25.0% in the energy ablative group and 11.3% in the surgery group ($p = 0.01$). Complications in the surgery group included infection in 4 men, bladder neck contracture or stricture in 1, deep venous thrombosis in 1, pulmonary embolus in 2, lower extremity paresthesia in 2 and ileus in 2. In the energy ablation cohort complications included urine leak or fistula in 8 men, bladder neck contracture or urethral stricture in 8, pulmonary embolus in 1, thigh hematoma in 1, clot retention in 1, partial wound dehiscence in 1, small bowel obstruction in 1, intractable proctitis in 1 and death in 2.

Initial and eventual success rates of fistula repair were higher in the surgical group at 93.3% and 99.0% vs 80.7% and 86.5%, respectively (each $p < 0.01$). The eventual overall success rate of fistula repair was 92.8% (table 3).

Table 1. *Patient subgroup characteristics*

	No. RP (%)	No. Radiation/Ablation (%)	p Value
Overall	106 (50.4)	104 (49.6)	—
Bowel diversion	69 (65.0)	87 (83.6)	0.002
Muscle flaps or omentum	98 (92.4)	95 (91.3)	0.77
Buccal mucosal graft	0	46 (44.2)	<0.001
Concomitant stricture	15 (14.2)	27 (26.0)	0.03
Urinary incontinence	17 (16.0)	36 (34.6)	0.002
Artificial urinary sphincter	13 (12.2)	19 (18.2)	0.23
Complications	12 (11.3)	26 (25)	0.01

Table 2. *Prostate cancer treatment*

	No. Pts
External beam radiation	12
Brachytherapy	9
Cryotherapy	2
External beam radiation + brachytherapy	11
External beam radiation + salvage external beam radiation	24
Brachytherapy + salvage external beam radiation	27
RP + salvage external beam radiation	13
External beam radiation/brachytherapy/cryotherapy/HIFU + salvage RP	6

DISCUSSION

To our knowledge we report the largest cohort of RUF repair after prostate cancer treatment in the literature. Repair of RUF can be technically challenging due to anatomical considerations and preceding complicating factors, such as tissue damage from radiation or ablation and infection. Despite this we found an overall high success rate of RUF repair in the hands of experienced surgeons at 4 reconstructive urology centers. Our findings reveal a lower success rate of RUF repair in patients who underwent prior radiation or ablation for prostate cancer. However, our success rate remained high in this group at 86.5% and we strongly advocate attempted surgical repair in these patients.

Some groups have reported poor outcomes of fistula repair in patients with previous prostate radiation or ablation, and advocated early permanent urinary and bowel diversion. In a series of 50 patients with RUF after prostate or rectal cancer primary fistula repair was successful in 80.9% of nonirradiated patients compared to 0% of irradiated patients ($p < 0.01$).[3] In that study permanent colostomy and urostomy developed in 83% and 100% of irradiated patients, respectively. Another group reported that fistula repair was attempted in only 6 of 29 patients with prior radiation or ablation.[4] Only 1 of 6 patients had a successful closure, and 86% and 93% required permanent colostomy and urostomy, respectively. We advocate early referral of these patients to surgeons experienced with RUF repair, who can achieve high success rates.

Our results also attest to the success of varying surgical approaches to RUF. The surgical approaches used in our cohort included abdominal, transperineal and combined abdominoperineal approaches. The transperineal approach can be done with the patient in the exaggerated lithotomy or prone jackknife position.[6] None of our surgeons used the transrectal or transsphincteric (York-Mason) approach. We believe that a transrectal approach does not as easily facilitate incorporation of an interposition flap or graft.

Table 3. *RUF repair outcomes*

	No. Pts	No. RP (%)	No. Radiation/Ablation (%)	p Value
Overall	210 (100)	106 (50.4)	104 (49.6)	
Success:				
Initial	183 (87.1)	99 (93.3)	84 (80.7)	0.006
Eventual	195 (92.9)	105 (99)	90 (86.5)	<0.001

Our surgeons commonly use an interposition flap or graft in RUF repair. We advocate placing interposition muscle flaps between the urinary system and the rectum in patients with prior prostate radiation or ablation due to the extent of tissue damage and poor wound healing from treatment. In a recent systematic review Hechenbleikner et al described surgical techniques and outcomes in adults with acquired RUF.[11] They found that at most high volume centers transperineal repairs were performed with tissue flaps. In our series the gracilis flap was most commonly used. The gracilis flap can be harvested with the patient in the supine lithotomy position and the prone jackknife position. It is an ideal tissue transfer candidate as it provides robust, well vascularized tissue that can be interposed at the target site. Only 1 of our surgeons used the abdominoperineal approach, in which case a gracilis or an omental flap can be incorporated as an interposition.

We report good outcomes and advocate the use of flaps and grafts in RUF repair. However, our study was not designed to evaluate the outcome of the use vs the nonuse or the type of interposition tissue.

The surgeons in our study are urologists who specialize in reconstructive surgery. Broadly speaking, RUF can also be repaired by colorectal surgeons. However, we believe that RUF after prostate cancer treatment is more often managed by urologists and not by colorectal surgeons because prostate cancer is a disease diagnosed and treated by urologists. Therefore, complications as a result of treatment are more likely to be managed by urologists.

Hanna et al at Duke University have examined other indicators of increased surgical complexity of RUF repair in the irradiated patient.[13] In that cohort of 37 men they found that those with an irradiated fistula had higher blood transfusion requirements, longer time to ostomy reversal and more complex operative repairs, including gracilis interposition flaps in 37% and pelvic exenteration in 19%.

We observed that the incidence of postoperative incontinence was more than doubled in patients with energy ablative fistulas. It is well established that urinary incontinence develops after radical prostatectomy due to the decreased integrity of the bladder neck and damage to the external sphincter at surgery. Surgical dissection of the RUF at the vesicourethral anastomosis may also worsen the continence mechanism in these patients.

We believe that the higher incontinence rate in the energy ablative cohort represents the subset of patients who underwent combined surgery and energy ablative therapy or those who had a large, complex fistula that spanned beyond the prostatic cavity to involve the bladder neck and external urinary sphincter, thereby compromising the continence mechanisms. Interestingly, 76.5% of incontinent patients in the nonirradiated group subsequently received an artificial urinary sphincter compared to 52.8% in the radiation/ablation group. Selph et al reported successful outcomes in 6 patients who underwent artificial urinary sphincter placement after RUF repair.[14] In that series 2 patients underwent prior thermal ablative treatment. Transcorporeal placement was not done and no complications were reported at a mean followup of 43.5 months.

Only a few groups have examined patient quality of life indicators after RUF repair. Samplaski et al evaluated fecal and urinary quality of life after RUF repair performed via a transperineal approach with a gracilis interposition flap.[15] Nine of 12 patients (75%) reported some degree of stress, urge or mixed incontinence and 2 reported significant incontinence "most of the time." However, only 2 of 13 men (15%) characterized urinary symptoms as having a significant impact on overall quality of life.

There are limitations inherent to the multicenter, retrospective nature of this study. The degree of variability in patient characteristics and surgical techniques among surgeons was difficult to quantify, given that data collection was a collaborative effort by different investigators. Patient followup was variable among investigators at a minimum of 6 months. In our experience this followup is adequate since fistula recurrence and complications of repair are expected to develop within a few months of surgery. Given the low rate of rectourethral fistula after prostate cancer treatment and the nonuniformity of these cases, a prospective analysis of operative management was not feasible.

CONCLUSIONS

Our findings suggest that the majority of patients with rectourethral fistula can avoid permanent urinary diversion with an overall success rate of 92.8% when referred to a surgeon familiar with these cases. Bowel diversion and muscle or omental flaps should be used in rectourethral fistula repair.

REFERENCES

1. Mundy AR and Andrich DE: Posterior urethral complications of the treatment of prostate cancer. BJU Int 2012; **110:** 304.
2. Venkatesan K, Zacharakis E, Andrich DE et al: Conservative management of urorectal fistulae. Urology 2013; **81:** 1352.
3. Beddy D, Poskus T, Umbreit E et al: Impact of radiotherapy on surgical repair and outcome in patients with rectourethral fistula. Colorectal Dis 2013; **15:** 1515.
4. Linder BJ, Umbreit EC, Larson D et al: Effect of prior radiotherapy and ablative therapy on surgical outcomes for the treatment of rectourethral fistulas. J Urol 2013; **190:** 1287.
5. Hadley DA, Southwick A and Middleton RG: York-Mason procedure for repair of recto-urinary fistulae: a 40-year experience. BJU Int 2012; **109:** 1095.
6. Voelzke BB, McAninch JW, Breyer BN et al: Transperineal management for postoperative and radiation rectourethral fistulas. J Urol 2013; **189:** 966.
7. Goodwin WE, Turner RD and Winter CC: Rectourinary fistula: principles of management and a technique of surgical closure. J Urol 1958; **80:** 246.
8. Kilpatrick FR and Mason AY: Post-operative recto-prostatic fistula. Br J Urol 1969; **41:** 649.
9. Varma MG, Wang JY, Garcia-Aguilar J et al: Dartos muscle interposition flap for the treatment of rectourethral fistulas. Dis Colon Rectum 2007; **50:** 1849.
10. Mundy AR and Andrich DE: Urorectal fistulae following the treatment of prostate cancer. BJU Int 2011; **107:** 1298.
11. Hechenbleikner EM, Buckley JC and Wick EC: Acquired rectourethral fistulas in adults: a systematic review of surgical repair techniques and outcomes. Dis Colon Rectum 2013; **56:** 374.
12. Vanni AJ, Buckley JC and 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:** 2400.
13. Hanna JM, Turley R, Castleberry A et al: Surgical management of complex rectourethral fistulas in irradiated and nonirradiated patients. Dis Colon Rectum 2014; **57:** 1105.
14. Selph JP, Madden-Fuentes R, Peterson AC et al: Long-term artificial urinary sphincter outcomes following a prior rectourethral fistula repair. Urology 2015; **86:** 608.
15. Samplaski MK, Wood HM, Lane BR et al: Functional and quality-of-life outcomes in patients undergoing transperineal repair with gracilis muscle interposition for complex rectourethral fistula. Urology 2011; **77:** 736.