CANADIAN JOURNAL OF UROLOGY

Tech Science Press

https://doi.org/10.32604/cju.2026.073870
CASE REPORT

Gracilis muscle flap for salvage repair of radiation-induced urethroperineal fistula after rectal cancer surgery: a case report

Changhao Hou,[1,2#] Ruihang Zhang,[1,2#] Pengbo Luo,[3] Weidong Zhu,[1,2] Lujie Song[1,2*]

[1]Department of Urology, Shanghai Sixth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai, China
[2]Shanghai Eastern Institute of Urologic Reconstruction, Shanghai, China
[3]Department of Orthopedic Surgery, Shanghai Sixth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Shanghai, China

HOU C, ZHANG R, LUO P, ZHU W, SONG L. Gracilis muscle flap for salvage repair of radiation-induced urethroperineal fistula after rectal cancer surgery: a case report. *Can J Urol* 2026;33(5):1333–1337.

Background: *Urethroperineal fistula (UPF) is a rare urological condition with significant heterogeneity and limited treatment consensus. Especially in patients with a history of radiotherapy, extensive tissue damage often leads to insufficient local tissue reconstruction.*
Case Description: *A 61-year-old male with a history of rectal cancer radiotherapy and abdominoperineal resection developed UPF, which recurred after robot-assisted prostatectomy combined with perineal fistula repair and scrotal dartos flap interposition. Imaging confirmed a 2 cm × 3 cm fistula defect at the prostatic urethra stump. We performed gracilis muscle flap transfer to repair UPF. Postoperative follow-up included urethrography, cystoscopy, and patient-reported outcome measures. At 1-year follow-up, the fistula was resolved without recurrence; the patient underwent artificial urinary sphincter implantation for pre-existing incontinence, achieving satisfactory urinary control and no limb mobility impairment.*
Conclusions: *Surgical outcomes and long-term follow-up confirmed the efficacy of the procedure and high patient satisfaction. The key lessons include thorough scar excision for vascularization, and meticulous preservation of the gracilis muscle's neurovascular pedicle to ensure flap viability.*

Key Words: case report, urethroperineal fistula, gracilis muscle flap, radiation-induced, rectal cancer

Introduction

Urinary fistulas of the genitourinary tract are a severe complication of radiotherapy for pelvic diseases. In male cancers, approximately 28% of patients receive pelvic radiotherapy (for prostate, rectal, and anal cancers); in females, the figure is about 19% (for cervical and vulvar cancers). Among these, the incidence of vesicovaginal or rectovaginal fistula after radiotherapy for cervical cancer ranges from 22% to 48%; the incidence of urethrorectal fistula after radiotherapy for prostate cancer is approximately 0.1% to 3%.[1] Furthermore, the rate of surgical procedures involving radiotherapy is increasing annually, with over 50% of patients with rectourethral fistula (RUF) currently having a history of radiotherapy.[2] Urethroperineal fistula (UPF) is a rare type among these, characterized by high treatment difficulty and a high recurrence rate.[3,4] The clinical manifestations are mainly urinary leakage through the perineum during voiding, pain, swelling in the perineum, and repeated urinary tract infections.[5] Existing treatments include transperitoneal approach to fistula removal,

Received date 27 September 2025
Accepted for publication 21 April 2026
Published online 30 October 2026

[#]These authors contributed equally to this study

*Corresponding Author: Lujie Song.
Email: ljsong@sjtu.edu.cn

Copyright © 2026 The Authors. Published by Tech Science Press; 33(5); October 2026

electrocauterization of the fistula tract, and interposition with muscle flaps.[6–8] However, there is still no standard treatment plan. When the fistula is large, especially in patients with a history of radiotherapy, extensive tissue damage often results in insufficient local tissue for reconstruction. Radiotherapy leads to histopathological alterations, including microvascular damage, progressive fibrosis, and tissue necrosis, which may underlie poor tissue healing and a high recurrence rate.[9] In such cases, distant tissue transfer becomes a viable option. The gracilis muscle, due to its extensive mobility and ability to reach the perineum, has emerged as a promising option.

Reports of gracilis muscle flap interposition specifically for radiation-associated UPF after rectal cancer treatment remain scarce. This study is also reported in accordance with the CARE guidelines (Supplementary Material S1).

Written informed consent was obtained from the patient for the use of their case details in an academic publication. This study has been approved by the Ethics Committee of Shanghai Sixth People's Hospital (No. 2026-KY-102(K)).

Case Report

A 61-year-old male presented with a one-year history of perineal urinary leakage, pain, and urinary incontinence. Five years ago, the patient received radiotherapy for rectal at another institution. Subsequently, in September 2020, he underwent abdominoperineal resection for rectal cancer. Several weeks after the surgery, he experienced urinary leakage through the anus during voiding. In August 2021, the patient developed a urethroperineal fistula located in the prostatic urethra and consequently underwent robot-assisted prostatectomy combined with perineal fistula repair at an external hospital; however, the fistula subsequently recurred. In August 2022, a scrotal dartos flap interposition was performed to repair the UPF, but it again recurred. Physical examination revealed a tiny opening in the perineal skin with active fluid discharge; CT revealed a urethroperineal fistula after prostate surgery and rectal surgery, and external bladder drainage. MRI revealed a fistula located in the prostatic urethral stump, measuring approximately 3 cm in length, without involvement of the bladder neck (Figure 1).

"Gracilis muscle flap transfer urethroperineal fistula repair" was performed (Supplementary Material S2). During the procedure, the urethra was mobilized, revealing a 2 cm × 3 cm fistulous defect. The perifistulous scar tissue was excised. The surgical procedure for the urethra was complete excision of scar tissue and primary tension-free continuous closure of the fistula defect. The gracilis tendon was detached from its insertion near the tibial plateau. The muscle was then mobilized. A subcutaneous tunnel was created through skip incisions spaced approximately 5 cm apart. Subsequently, the detached distal end of the gracilis muscle was rotated 180 degrees and transferred to the perineum via a subcutaneous tunnel about 5 cm wide, easily accommodating two fingers. During the dissection, special care was taken to identify and preserve the main neurovascular pedicle located in the proximal third of the muscle. The flap was secured over the repair site by anchoring it to the surrounding healthy tissue with interrupted absorbable sutures (3-0 Vicryl). Postoperative assessments included the Urethral Stricture Surgery Patient-Reported Outcome Measures (USS-PROM), International Index of Erectile Function (IIEF-5), and the International Consultation on Incontinence Questionnaire (ICIQ).

Postoperatively, the patient experienced normal urination without perineal leakage. At one-year follow-up, urethrography showed an intact urethra with no contrast extravasation, confirming fistula resolution; cystoscopy further confirmed an intact urethral wall with no recurrence of the fistula; ICIQ score was 21 points and IIEF-5 score was 5 points. The patient reported satisfaction with the outcome, with no limb mobility issues postoperatively; histological examination of the urethral tissue showed proliferative collagen fibers, chronic inflammatory cell infiltration, and no evidence of malignancy. To treat the pre-existing severe urinary incontinence, the patient underwent an artificial urinary sphincter implantation, which resulted in satisfactory urinary control postoperatively.

Discussion

UPF is a rare urological condition with very few reported cases in the literature. Consequently, there is limited experience in its diagnosis and treatment. This condition severely impacts patients' health and quality of life, and the recurrent urinary irritation in the fistula tract may predispose patients to cancer development. The gracilis muscle is the most frequently utilized tissue flap in urinary fistula repair. Although data on its use specifically for UPF are lacking, studies indicate a surgical success rate of up to 91% for gracilis muscle flap repair of urethrorectal fistula.[2] A history of radiotherapy is one of the risk

Copyright © 2026 The Authors. Published by Tech Science Press; 33(5); October 2026

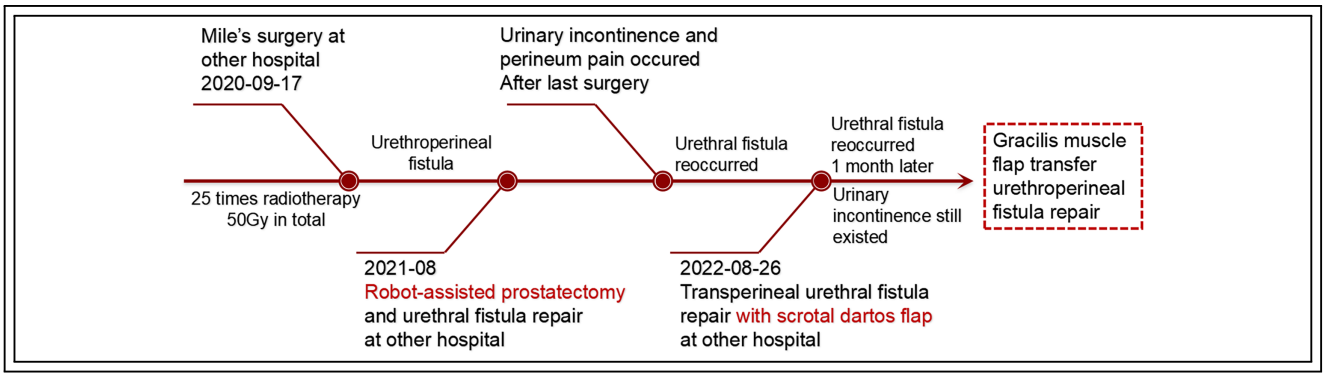

FIGURE 1. Timeline flowchart of the patient's medical consultation process

factors affecting surgical success. The success rate for urethrorectal fistula repair in patients with a history of radiotherapy is approximately 61.5%.[10]

In this case, based on the patient's medical history, clinical presentation, and imaging evaluation, the diagnosis was confirmed, further establishing the necessity for surgical intervention. However, it is noteworthy that imaging and clinical symptoms suggested the fistula's proximity to the bladder neck, posing a potential risk of aggravated urinary incontinence postoperatively. On one hand, the patient and family were thoroughly informed of the associated risks and the high complexity of the procedure; on the other hand, every effort was made intraoperatively to preserve bladder tissue, allowing room for future management of urinary incontinence if needed.

Due to factors such as etiology, fistula location, and size, UPFs exhibit significant heterogeneity among patients. There is no standardized treatment protocol, making individualized management particularly crucial. This patient had a history of radiotherapy, a personal history of rectal cancer, and multiple failed urethral reconstructive procedures—factors that compounded the surgical difficulty. Unlike congenital UPF, acquired cases, especially post-radiotherapy fistulas, involve poor perineal tissue vascularization, high recurrence rates, and limited treatment options. The etiology of congenital UPF remains unclear. Some authors suggest it results from focal defects in the urethral plate that disrupt urethral fusion. Compared to acquired cases, the tissue condition in congenital fistulas is relatively favorable.[11]

Muscle flaps, with their robust blood supply, are promising autologous grafts widely used in urethral fistula repair. Currently, clinically available muscle flaps include the Martius flap, rectus abdominis flap, and omental flap, among others. Among these, the Martius flap and rectal advancement flap are located close to the fistula site, are easy to mobilize, and do not significantly affect donor site function after transposition. However, these flaps are relatively thin and cannot be mobilized over long distances, making them suitable only for small and distal fistulas. Nevertheless, for radiotherapy-induced fistulas, perineal tissue flaps are not ideal, further narrowing the range of feasible autologous graft options. The rectus abdominis flap and omental flap are suitable for large fistulas but involve significant trauma and a higher risk of complications. After comprehensive consideration, the gracilis muscle was selected for interposition grafting during the procedure. While the gracilis muscle flaps have been used for various urinary fistulas, this study represents its first application for refractory radiation-induced a UPF. This muscle offers high mobility, minimal impact on limb function, and a multi-source blood supply, ensuring flap viability.

During surgery, a perineal approach was used to dissect the urethral segment adjacent to the fistula, without resecting any healthy urethral and bladder neck tissue, and maintain the anatomical continuity and functional structure of the non-fistular urethral and bladder neck tissue. Scar tissue around the fistula was thoroughly excised to prevent hyperplasia and ensure adequate vascularization. Gracilis muscle transfer reinforced the fistula site, reducing recurrence risk. Care was taken during transfer to ensure sufficient mobilization for effective coverage and to preserve its blood supply. Additionally, given the patient's history of rectal cancer, histological assessment of the fistula and adjacent tissues was imperative.

Standardized follow-up questionnaires provided a convenient means to monitor the patient's condition. Surgical outcomes and long-term follow-up

Copyright © 2026 The Authors. Published by Tech Science Press; 33(5); October 2026

confirmed the procedure's effectiveness and high patient satisfaction. One year postoperatively, the patient underwent an artificial urinary sphincter implantation, achieving satisfactory continence and significantly improved quality of life. This case adds valuable experience to the management of complex urinary fistulas and offers a novel solution for refractory UPFs. The study has several limitations, including the lack of validation in large cohort studies, short follow-up duration, and the influence of patient-specific factors on surgical outcomes.

Conclusions

Gracilis muscle flap interposition offers an effective surgical option for the treatment of UPF secondary to radiotherapy, providing a promising approach for such complex fistulas that failed multiple repairs.

Acknowledgement

Not applicable.

Funding Statement

This research was funded by Summit Plateau Program, Research Physician Program, Shanghai Jiao Tong University School of Medicine, grant number 20240817.

Author Contributions

The authors confirm contribution to the paper as follows: Conceptualization, Lujie Song; methodology, Lujie Song and Pengbo Luo; software, Changhao Hou; validation, Changhao Hou, Ruihang Zhang, Pengbo Luo, Weidong Zhu and Lujie Song; formal analysis, Changhao Hou and Ruihang Zhang; investigation, Changhao Hou and Lujie Song; resources, Lujie Song; data curation, Changhao Hou; writing—original draft preparation, Changhao Hou; writing—review and editing, Lujie Song; visualization, Lujie Song; supervision, Lujie Song; project administration, Lujie Song; funding acquisition, Lujie Song. All authors reviewed and approved the final version of the manuscript.

Availability of Data and Materials

Data available on request from the authors.

Ethics Approval

Written informed consent was obtained from the patient for the use of their case details in an academic publication. This study has been approved by the Ethics Committee of Shanghai Sixth People's Hospital (No.:2026-KY-102(K)).

Conflicts of Interest

The authors declare no conflicts of interest.

Supplementary Materials

The supplementary material is available online at https://www.techscience.com/doi/10.32604/cju.2026.073870/s1.

Abbreviations

The following abbreviations are used in this manuscript:

UPF	Urethroperineal fistula
USS-PROM	Urethral Stricture Surgery Patient-Reported Outcome Measures
IIEF-5	International Index of Erectile Function
ICIQ	International Consultation on Incontinence Questionnaire

References

1. Kocot A, Riedmiller H. Fisteln des Urogenitaltraktes nach Strahlentherapie [Fistulas of the urogenital tract after radiotherapy]. *Urologe A* 2017;56(3):329–335. doi:10.1007/s00120-017-0320-9.
2. 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):374–383. doi:10.1097/DCR.0b013e318274dc87.
3. Sakaguchi T, Hamada Y, Matsushima H et al. Congenital urethro-perineal fistula. *J Pediatr Surg Case Rep* 2018;28(6):17–20. doi:10.1016/j.epsc.2017.09.031.
4. Ghadimi-Mahani M, Dillman JR, Pai D et al. MRI of congenital urethroperineal fistula. *Pediatr Radiol* 2010;40(S1):1–5. doi:10.1007/s00247-010-1852-y.
5. Meier DE, Latiff A. Y-type congenital urethral duplication with normal dorsal urethra and small ventral fistula to

Copyright © 2026 The Authors. Published by Tech Science Press; 33(5); October 2026

perineal skin−28th reported case. *J Pediatr Surg Case Rep* 2016;8(1):37–39. doi:10.1016/j.epsc.2016.03.008.
6. Cheng JW, Ahn JJ, Cain MP et al. Misdiagnosis of congenital posterior urethroperineal fistula and comparison with urethral duplications and rectourethral fistula. *Urology* 2021;158:193–196. doi:10.1016/j.urology.2021.09.013.
7. Brown WC, Dillon PW, Hensle TW. Congenital urethral-perineal fistula: diagnosis and new surgical management. *Urology* 1990;36(2):157–159. doi:10.1016/0090-4295(90)80216-A.
8. Gys B, De Hous N et al. Fistula-tract Laser Closure (FiLaC^{TM}) for complex urethroperineal fistula. *Acta Chir Belg* 2018;118(6):340–398. doi:10.1080/00015458.2018.1515337.
9. Chrouser KL, Leibovich BC, Sweat SD et al. Urinary fistulas following external radiation or permanent brachytherapy for the treatment of prostate cancer. *J Urol* 2005;173(6):1953–1957. doi:10.1097/01.Ju.0000158041.77063.ff.
10. Voelzke BB, McAninch JW, Breyer BN et al. Transperineal management for postoperative and radiation rectourethral fistulas. *J Urol* 2013;189(3):966–971. doi:10.1016/j.juro.2012.08.238.
11. Alemu CT, Bekele FS, Asnakew SL et al. Congenital posterior urethroperineal fistula, a rare congenital anomaly presented in an adult male patient: a case report. *BMC Urol* 2025;25(1):75. doi:10.1186/s12894-025-01759-x.

Copyright © 2026 The Authors. Published by Tech Science Press; 33(5); October 2026