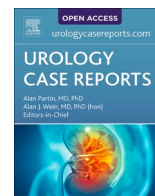


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Oncology

Rectourethral fistula following SpaceOAR gel placement for prostate cancer radiotherapy: A rare complication

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ABSTRACT

After undergoing a SpaceOAR® gel placement prior to planned radiotherapy for Gleason 4 + 4 prostate cancer, a 70-year-old male experienced severe right buttock pain and urine passing from his rectum. A colonoscopy and follow-up pelvic MRI demonstrated a large rectourethral fistula. The fistula was treated surgically with a robot-assisted radical prostatectomy, primary rectal repair, omental flap and diverting loop ileostomy. Pathology demonstrated extensive treatment effect with no residual prostate cancer. This is the first case study of a rectourethral fistula attributable to SpaceOAR® gel placement.

Introduction

SpaceOAR® is a Food and Drug Administration (FDA)-approved hydrogel injection system used to inject synthetic polyethylene glycol hydrogel between the prostate and rectum prior to prostate radiotherapy.¹ Although initial clinical trials demonstrated 99% technical success rate and high safety profile, several complications can occur, including possible needle penetration of the bladder, prostate, rectal wall, rectum, or urethra.^{1,2} A very rare complication from SpaceOAR® is a rectourethral fistula. We present the first case study in the literature of a rectourethral fistula directly attributable to SpaceOAR®.

Case presentation

The patient is a 70-year-old white male initially presenting with elevated PSA (10.9 ng/ml). Pertinent medical history includes hypertension, coronary artery disease, myocardial infarction, chronic obstructive pulmonary disease, obesity, and recent finding of spondylosis during evaluation for back pain. Transrectal ultrasound-guided prostate biopsy demonstrated Gleason 4 + 4 prostate cancer with eight of 12 cores positive (Fig. 1). After discussing multiple treatment options, the patient chose androgen deprivation therapy with external beam radiation therapy. The patient received a 6-month Lupron

injection, and five weeks later underwent T9-T11 and L2-S1 laminectomies without complication. Two months later, the patient underwent a transrectal ultrasound-guided placement of SpaceOAR® hydrogel (Fig. 2). The patient tolerated the procedure well initially but began to experience pain by the time he reached his car. That afternoon, he presented to the emergency department for constant right-sided buttock pain that radiated down his thigh. A CT pelvis showed no acute findings. Three weeks later, the patient began experiencing urine leakage from his rectum. Colonoscopy revealed a large distal anterior rectal ulceration, likely secondary to disruption of the anterior rectal wall, with rectourethral fistula (Fig. 3A). Biopsy revealed ulcer and granulation tissue with reactive glandular elements consistent with urothelial/prostatic origin. MRI pelvis showed a wide area of communication between the rectum and prostate (Fig. 3B), apparently communicating with the prostatic urethra and extending along the ejaculatory ducts.

He presented to the urology clinic for discussion of treatment options. At that time, his urine was passing through his rectum with only a trace amount through the penis. He was fully continent of urine by anus and never noticed any feces in his urine stream. Immediate repair or temporary diversion of the fecal and urinary streams with delayed repair were considered. After discussion with a colorectal surgeon, the patient was prepared to undergo (a) robotic prostatectomy, (b)

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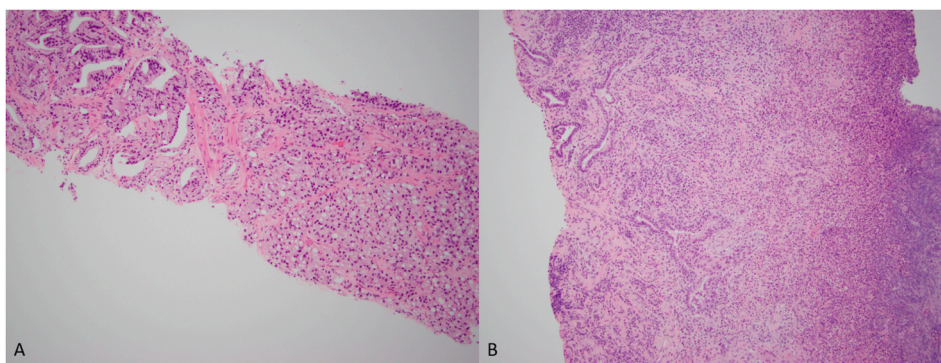


Fig. 1. (A) Prostate biopsy indicates pattern 4 prostatic adenocarcinoma (Grade group 4) before treatment. (B) Prostatectomy specimen with histiocytic and giant cell reaction. The entire prostate demonstrated this type of reaction; no residual carcinoma was identified.

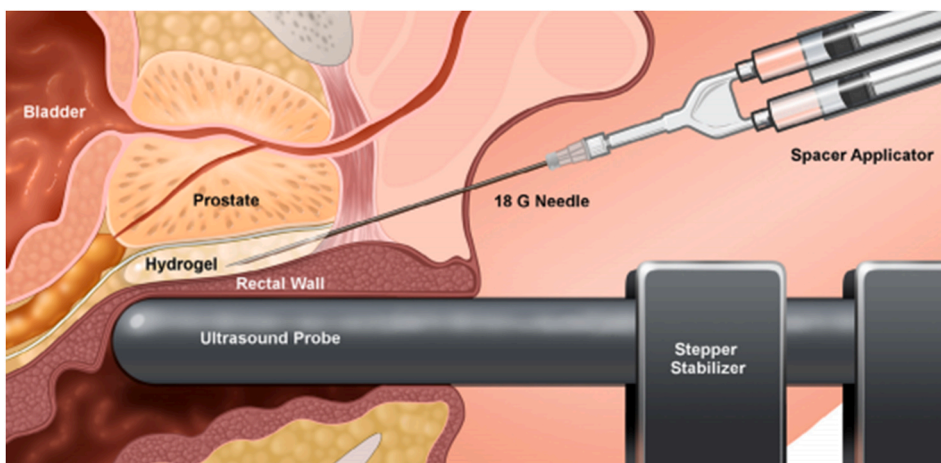


Fig. 2. Anatomic considerations during SpaceOAR procedure, indicating the proximity of the bladder to the rectum. Reprinted from Urology 115, Karsh LI, Gross ET, Pieczonka CM et al. Absorbable Hydrogel Spacer Use in Prostate Radiotherapy, 39-44, 2018, with permission from Elsevier under the Creative Commons CC-BY-NC-ND license.

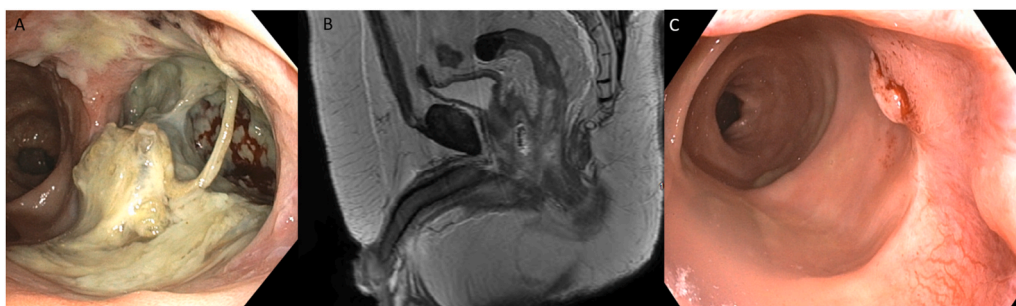


Fig. 3. (A) Colonoscopy demonstrates large distal anterior rectal ulceration which was likely secondary to the disruption of the anterior rectal wall with rectourethral fistula. (B) MRI pelvis demonstrates a wide area of communication between the rectum and the prostate after SpaceOAR procedure. (C) Colonoscopy two months after surgery demonstrates well-healed rectal repair with some granulation tissue.

intraoperative evaluation of the fistula with plan for primary repair of the rectal defect or low anterior resection, (c) omental pedicle flap, and (d) diverting loop ileostomy. Surgery was performed three months after the SpaceOAR® procedure. Harvest of the omental flap was performed using the daVinci Xi robot oriented towards the upper abdomen with the patient in reverse Trendelenberg position. The robot was then re-docked with the patient in Trendelenberg position for prostatectomy and bilateral pelvic lymph node dissection (PLND). The Foley catheter placed during surgery passed from the distal urethra directly into the rectum, resulting in distension of the bladder from the

pneumoperitoneum after the posterior prostatic dissection. The PLND and prostatectomy were then completed in the typical manner. The only unique aspect was the posterior dissection, which included resection of the fistula tract as a part of the specimen. Attention was turned to separation of the components of the fistula. The rectal defect, measuring 2.5–3.0 cm, was approximated primarily in the transverse orientation. The omental pedicle flap was rotated along the left gutter into the pelvis; it was interposed between the rectal repair and the urethra and secured in this position. The urethrovesical anastomosis was completed with a double-armed barbed suture using the van Velthoven technique. A

suprapubic catheter was placed to maximize urinary diversion. A diverting loop ileostomy was placed to divert the fecal stream from the rectal repair. The patient tolerated the procedure well and was discharged home one day later.

The procedure and post-operative course were without complication. The urethral catheter was removed four weeks from surgery after serial cystograms showed a persistent small urethral anastomotic leak. Subsequent urethrogram demonstrated complete healing, and the suprapubic catheter was removed one week later. His pathology demonstrated extensive treatment effect with no cancer remaining within his prostate or 14 pelvic lymph nodes (Fig. 1). The treatment effect extended multifocally and extensively outside the prostate to the resection margin. Colonoscopy two months after revealed a well-healed rectal repair with granulation tissue (Fig. 3C), and reversal of the diverting ileostomy was performed with an uncomplicated two day hospital stay.

Discussion

Rectourethral fistula from hydrogel spacer insertion is a rare complication. A systematic review including 671 patients undergoing spacer insertion found only 2 cases (0.30%) of prostatorectal fistulas, each managed with permanent diverting colostomy.³ One case developed a fistula four months after finishing radiation treatment⁴ and the other developed a fistula seven months after radiation.⁵ A review of complications of SpaceOAR® placement from reports submitted to the FDA's Manufacturer and User Facility Device Experience (MAUDE) database between 2015 and 2019 found 25 major complications reported including rectal wall erosion and four cases of rectourethral fistula.² The MAUDE study is limited by its minimal data about patient and disease characteristics, and the major complications could be associated with the disease process, patient co-morbidities, or radiotherapy itself. Although radiotherapy can cause rectourethral fistulas, the patient in this case did not receive any radiation, and his symptoms began immediately after the procedure, making SpaceOAR® placement the likely culprit for his fistula.

This interesting, rare complication was managed with robotic omental pedicle flap and diverting ileostomy. Our goal is for the patient to be urinating and defecating normally, which was achieved within eight months of the initial incident with only two brief hospital stays. It appears unlikely that the observed treatment effect would have been caused by a single 45-mg dose of leuprolide and perhaps the significant inflammatory response to the SpaceOAR® gel may also have had an antitumoral effect.

Conclusion

This case study suggests that, while rare, a rectourethral fistula is a potential complication of SpaceOAR® gel placement. Nevertheless,

preservation of urinary and fecal function can be achieved with surgical repair.

Ethical approval

Spectrum Health Institutional Review Board does not require ethical approval for reporting an individual case report that only documents the observations of a patient receiving medical care because there is no intent to test a hypothesis via a systematic data analysis.

Author contributions

Joshua M. Kuperus: Writing – original draft. Donald G. Kim: Writing- Reviewing and Editing. Tanmay Shah: Resources, Visualization. George Ghareeb: Writing- Reviewing and Editing. Brian R. Lane: Conceptualization, Funding acquisition, Supervision, Writing- Reviewing and Editing.

Declaration of competing interest

The authors have no conflicts of interest to declare.

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References

1. Karsh LI, Gross ET, Pieczonka CM, et al. Absorbable hydrogel spacer use in prostate radiotherapy: a comprehensive review of phase 3 clinical trial published data. *Urology*. 2018;115:39–44. <https://doi.org/10.1016/j.urology.2017.11.016>.
2. Aminsharifi A, Kotamarti S, Silver D, Schulman A. Major complications and adverse events related to the injection of the SpaceOAR hydrogel system before radiotherapy for prostate cancer: review of the manufacturer and user facility Device experience database. *J Endourol*. 2019;33(10):868–871. <https://doi.org/10.1089/end.2019.0431>.
3. Vaggors S, Rai BP, Chedgy ECP, de la Taille A, Somani BK. Polyethylene glycol-based hydrogel rectal spacers for prostate brachytherapy: a systematic review with a focus on technique [published online ahead of print, 2020 Aug 25]. *World J Urol*. 2020. <https://doi.org/10.1007/s00345-020-03414-6>. doi:10.1007/s00345-020-03414-6.
4. Yeh J, Lehrich B, Tran C, et al. Polyethylene glycol hydrogel rectal spacer implantation in patients with prostate cancer undergoing combination high-dose-rate brachytherapy and external beam radiotherapy. *Brachytherapy*. 2016;15(3):283–287. <https://doi.org/10.1016/j.brachy.2015.12.007>.
5. Mahal BA, Ziehr DR, Hyatt AS, et al. Use of a rectal spacer with low-dose-rate brachytherapy for treatment of prostate cancer in previously irradiated patients: initial experience and short-term results. *Brachytherapy*. 2014;13(5):442–449. <https://doi.org/10.1016/j.brachy.2014.05.001>.