Central European Journal of Urology

CASE REPORT

UROLOGICAL ONCOLOGY

Pulmonary embolism following spacer hydrogel intravasation: A case report of a rare rectal spacer complication in prostate cancer radiotherapy

Gifford Tan, Wynne Yuru Chua, Arshvin Kesavan

National University Hospital (NUH), National University Health System (NUHS), Singapore

Citation: Tan G, Chua WY, Kesavan A. Pulmonary embolism following spacer hydrogel intravasation: A case report of a rare rectal spacer complication in prostate cancer radiotherapy. Cent European J Urol. 2026; 79: 317-320.

Article history
Submitted: Jan. 20, 2026
Accepted: Apr. 10, 2026
Published online: May 10, 2026

Corresponding author
Gifford Tan
National University Hospital (NUH),
National University Health System (NUHS),
5 Lower Kent Ridge Road,
Singapore 11974
gifford.tan@gmail.com

Localised prostate cancer is increasingly being treated with radiotherapy. As a result, rectal spacers such as the SpaceOAR™ System, Boston Scientific, Marlborough, MA, USA (SpaceOAR) are increasingly used to reduce radiation-related rectal toxicity. We report a rare case of hydrogel intravasation following rectal spacer insertion, with subsequent pulmonary embolisation detected on follow-up imaging. This case highlights the anatomical considerations underlying this complication, the limitations of intra-procedural safeguards, and the importance of routine post-procedural imaging to detect potentially asymptomatic but clinically significant adverse events.

Key Words: prostate cancer ‹› SpaceOAR ‹› iatrogenic disease ‹› pulmonary embolism ‹› rectal spacer ‹› radiotherapy

CASE REPORT

We report a case of a 78-year-old male patient with prostatic acinar adenocarcinoma, Gleason score 7 (3 + 4) grade group 2 with a history of atrial fibrillation on apixaban 5 mg once daily. He was initiated on androgen deprivation therapy (ADT) with a first monthly dose of subcutaneous Leuprorelin acetate 3.75 mg followed by 3 monthly subcutaneous Leuprorelin acetate 11.25 mg injections with the intention to complete 6 months of ADT in total. He was then scheduled for SpacerOAR insertion before radiotherapy of 60 Gy in 20 fractions.

His apixaban was withheld peri-procedurally for 2 days before and 3 days after his procedure. With the patient in the lithotomy position, a transperineal needle was inserted. The needle position was confirmed on two planes (axial and sagittal) using bipolar transrectal ultrasound. Hydrodissection via injection of 3 ml of saline showed expansion of a potential space that was thought to be the peri-rectal space posterior to Denonvillier's fascia. Needle aspiration revealed no blood. SpaceOAR gel was then injected with no significant resistance encountered. A hyperechoic gel was visualised anterior to the rectum. However, the proceduralist noted that the quantity of gel seen in this space was less than expected and circumferential echogenic material was also noted adjacent to the visualised prostate gland (Figure 1). The patient remained asymptomatic and was discharged.

An MRI prostate was performed one-month post-procedure. This scan showed T2w-hyperintense signal enveloping the prostatic pseudocapsule laterally

and anteriorly, compatible with that of the SpaceOAR hydrogel (Figure 2). There were also distended periprostatic veins with similar signal to that of the SpaceOAR hydrogel. The proximity to the SpaceOAR injection site, magnetic resonance imaging (MRI) signal characteristics and morphology raised the suspicion of intravasation of hydrogel into the periprostatic veins. After discussion with radiology, a computed tomography (CT) pulmonary angiogram was suggested to complete work-up for possible emboli. This showed tiny filling defects within the segmental branches of the right lower lobe pulmonary arteries. We postulate that gel injection into the periprostatic fascia resulted in periprostatic ve-

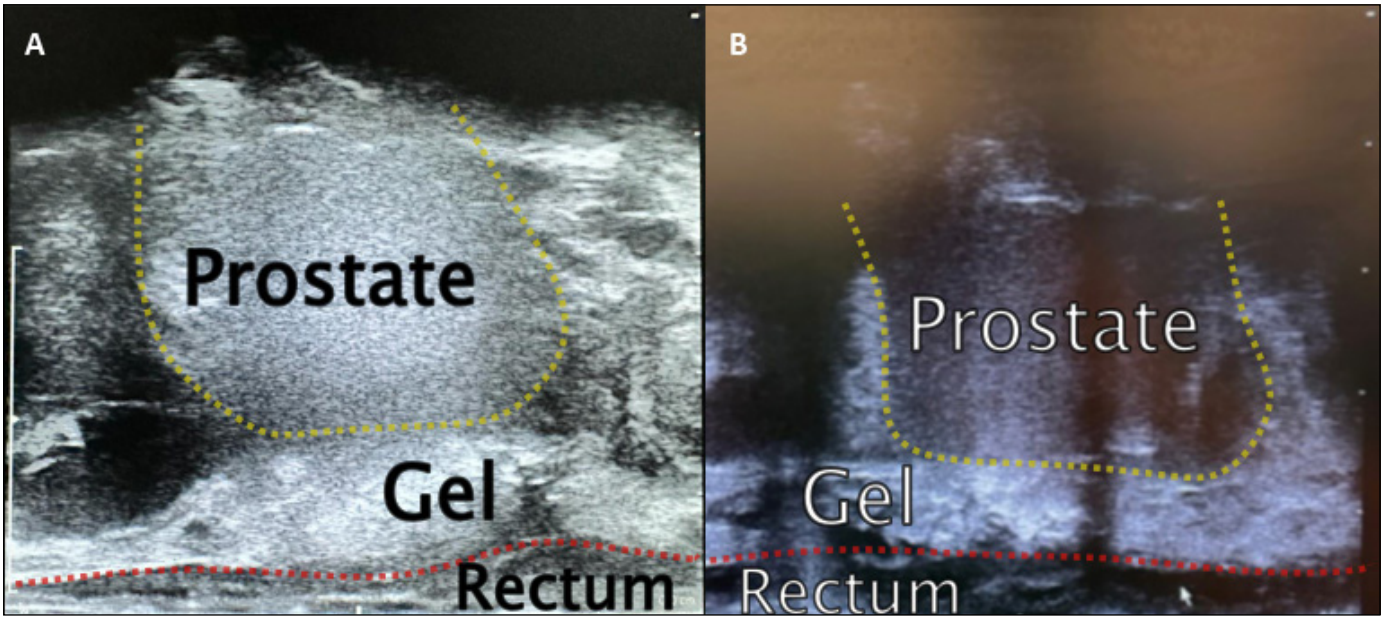

Figure 1. A) *Sagittal trans-rectal ultrasound image after normal gel placement in the anterior perirectal space.* **B)** *Sagittal trans-rectal ultrasound image showing a slightly reduced amount of recto-prostatic separation in our patient with circumferential echogenic material.*

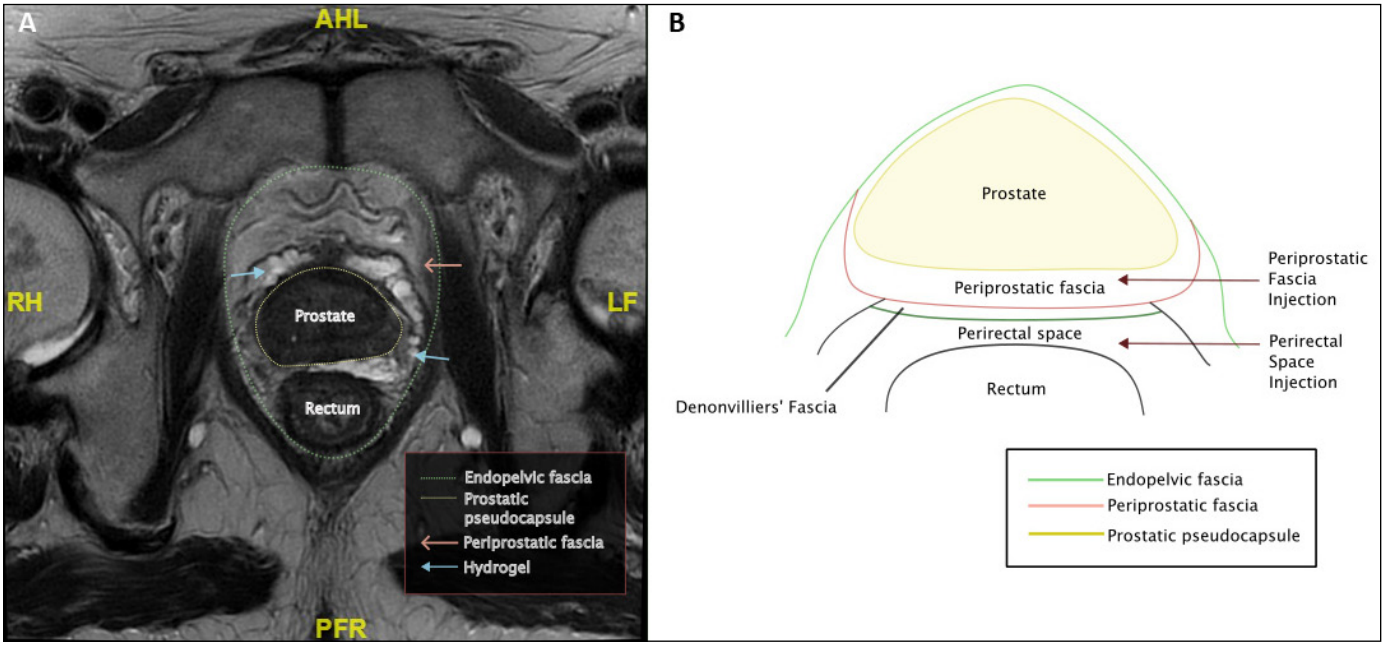

Figure 2. A) *Axial T2w MRI of our patient 1 month post SpaceOAR hydrogel insertion showing the prostate surrounded by T2w-hyperintense hydrogel.* **B)** *Diagram schematic of the expected perirectal space injection vs periprostatic fascia injection.*

nous intravasation that led to pulmonary embolism. The patient was asymptomatic with 100% oxygen saturations on room air and no evidence of right heart strain on electrocardiogram (ECG) or CT.

In view of the lack of symptoms, small embolic burden, and existing anticoagulation, a multidisciplinary decision between urology, haematology and vascular surgery was made, and conservative management was adopted after discussions with the patient. The patient completed 15 out of 20 radiotherapy fractions to his prostate. He was then diagnosed with an unrelated advanced oral cavity squamous cell carcinoma and declined further radiotherapy and ADT for his prostate cancer. At his last urology review, 7 months post SpaceOAR injection, the patient had no proctitis and remained asymptomatic from his SpaceOAR embolism. He passed away a year later from his oral cancer.

DISCUSSION

Prostate cancer is the second most common malignancy, with most patients presenting with low to intermediate risk localised disease [1]. Radiation therapy has emerged as a viable treatment option [2]. However, large trials have demonstrated an increased risk of bowel complications [3], prompting efforts to mitigate rectal toxicity. Rectal spacers increase the distance between the prostate and rectum and reduce the radiation dose to the anterior rectal wall [4]. SpaceOAR is one such biodegradable hydrogel that has received Food and Drug Administration clearance and maintains a Manufacturer and User Facility Device Experience (MAUDE) database to track complications and outcomes [5, 6].

Hydrogel rectal spacer insertion has a reported technical success rate of up to 97.0% [7]. Intravascular complications related to hydrogel intravasation remain rare, with few published case reports to date. One report described the timeline of incidental intravascular hydrogel with spontaneous resolution over 6 months [8], while another documented retrograde arterial embolisation via the right common iliac artery presenting with limb ischaemia [9]. In both cases, conservative management with anticoagulation was adopted. Reviews of the SpaceOAR MAUDE database have identified reports of hydrogel intravasation and pulmonary embolism, including 12 cases described by Millot et al. [5] and 11 embolic events reported by Fernandez et al. [6]. However, these reports provide limited detail regarding the extent of intravasation or subsequent management.

The present case is significant for several reasons. This report is the first to critically appraise the anatomy and pathophysiological mechanisms of intravasation. Second, it highlights the pitfalls of ultrasound and aspiration techniques. Third, it identifies additional imaging features of gel mispositioning and underscores the importance of early post-procedural imaging, even in asymptomatic patients.

At our institution, rectal spacers are inserted by urology proceduralists, who must first appreciate the intricate anatomy of Denonvilliers' fascia [10]. Denonvilliers' fascia is a multilayered structure that invests centrally into the prostatic capsule. The posterior plane separates the prostate from the perirectal space, which contains loose, avascular areolar tissue suitable for hydrodissection and hydrogel injection. We postulate that needle malpositioning resulted in the injection of approximately 10 ml of hydrogel into the periprostatic fascial plane rather than the intended perirectal space. This plane contains a dense, valveless venous plexus, particularly along the lateral and anterior aspects of the prostate. Elevated injection pressures within this confined space likely facilitated venous intravasation, with subsequent embolisation to the pulmonary circulation.

Several procedural principles are reinforced by this case. Cadaveric studies demonstrate that Denonvilliers' fascia consists of multiple layers [10], and proceduralists must be aware of the pitfall that inadvertent violation may allow hydrodissection mimicking correct spacer placement. Furthermore, although aspiration is commonly performed to exclude direct vascular puncture into a large vessel, gel intravasation may still occur if the needle tip is located in the wrong compartment, within or in close proximity to venous plexi, particularly when the needle tip lies within the periprostatic fascial plane.

We recommend confirmation of needle placement beneath Denonvilliers' fascia in 2 planes using careful bipolar ultrasound assessment. Secondly, a high index of suspicion for gel misplacement should be maintained when the observed perirectal separation is less than the expected 1 cm or when hydrogel is seen tracking circumferentially around the prostate. Thirdly, a post-procedure MRI or CT simulation should be performed routinely. Both for radiotherapy planning as well as for early detection of such complications. If gel intravasation is seen, further evaluation with a CT pulmonary angiogram should be considered in a step-wise fashion.

Management of confirmed hydrogel intravasation remains poorly defined. While prior reports describe anticoagulation [8, 9], its efficacy in treating hydrogel emboli is unknown. Given that spacer hydrogels undergo spontaneous hydrolysis over 6–12 months,

conservative management may be appropriate in asymptomatic patients. Anticoagulation may theoretically prevent bland thrombus propagation around the embolised material caused by interruptions to laminar blood flow, but this should be weighed on a case-by-case basis. Accordingly, we advocate a multidisciplinary approach and routine post-procedural imaging, recognising the potential for clinically silent but significant complications.

In conclusion, radiotherapy for prostate cancer with adjunct procedures to reduce rectal toxicity are likely to see increasing adoption rates. As the use of these procedures increases, rare complications are likely to be encountered more frequently. Appropriate patient counselling, detailed understanding of periprostatic anatomy, and heightened procedural vigilance are essential. Routine post-procedural imaging will enable early detection of asymptomatic complications, supporting timely multidisciplinary management.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

This research received no external funding.

ETHICS APPROVAL STATEMENT

The ethical approval was not required.

References

1. Nezolosky M, Nguyen PL, Yang DD. Which patients with localized prostate cancer account for the greatest proportion of prostate cancer deaths? J Clin Oncol. 2018; 36 (Suppl 6): 130.
2. Donovan JL, Hamdy FC, Lane JA, et al. Patient-reported outcomes after monitoring, surgery, or radiotherapy for prostate cancer. N Engl J Med. 2016; 375: 1425-1437.
3. Lawrie TA, Green JT, Forsyth R, et al. Interventions to reduce acute and late adverse gastrointestinal effects of pelvic radiotherapy for primary pelvic cancers. Cochrane Database Syst Rev. 2018; 1: CD012529.
4. Vaggers 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. World J Urol. 2021; 39: 1769-1780.
5. Millot JC, Arenas-Gallo C, Silver E, et al. Major complications and adverse events related to use of SpaceOAR hydrogel for prostate cancer radiotherapy. Urology. 2024; 188: 94-100.
6. Fernandez AM, Jones CP, Patel HV, et al. Real-world complications of the SpaceOAR hydrogel spacer: a review of the Manufacturer and User Facility Device Experience database. Urology. 2024; 183: 157-162.
7. Miller LE, Efstathiou JA, Bhattacharyya SK, et al. Association of the placement of a perirectal hydrogel spacer with the clinical outcomes of men receiving radiotherapy for prostate cancer: a systematic review and meta-analysis. JAMA Netw Open. 2020; 3: e208221.
8. Eckstein J, Makary MS, Cataland SR, et al. A case of hydrogel spacer intravasation of the internal iliac vein and associated thrombus formation during preparation for prostate cancer external beam radiation therapy. Pract Radiat Oncol. 2026; 16: 15-19.
9. Qiao Y, Patel S, Burney I, Mega JD, Kuban JD, Pisimisis GT. A case report: retrograde arterial embolization of locally-injected Space-OAR hydrogel material into the right common iliac artery bifurcation. Radiol Case Rep. 2023; 18: 719-726.
10. Tzelves L, Protogerou V, Varkarakis I. Denonvilliers' fascia: the prostate border to the outside world. Front Surg. 2022; 9: 824449.