UNIVERSA MEDICINA

pISSN: 1907-3062 / eISSN: 2407-2230

Univ Med 2025;44:201-207

DOI: https://doi.org/10.18051/UnivMed.2025.v44.201-207

CASE REPORT

Foley catheter guided by semi-rigid ureterorenoscopy in the treatment of bladder diverticulum: a case report

Made Kresna Yudhistira Wiratma[1], Ahmad Zulfan Hendri[2*], and Eko Subekti[3]

[1]Urology Residency Training Program, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada/Dr. Sardjito Hospital, Yogyakarta, Indonesia
[2]Division of Urology, Department of Surgery, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada/Dr. Sardjito Hospital, Yogyakarta, Indonesia
[3]Division of Urology, Department of Surgery, Banyumas Hospital, Banyumas, Indonesia

*** Correspondence Author:**
zulfan.hendri@ugm.ac.id

Date of first submission, May 31, 2025
Date of acceptance, June 25, 2025
Date of published, June 30, 2025

Cite this article as: Wiratma MKY, Hendri AZ, Subekti E. N Foley catheter guided by semi-rigid ureterorenoscopy in the treatment of bladder diverticulum: a case report. Univ Med 2025;44:201-207

ABSTRACT

BACKGROUND
A bladder diverticulum can be the consequence of a congenital abnormality or acquired as a result of trauma, infection, or outlet obstruction. Despite advancements in laparoscopic techniques, to date, precise intraoperative identification of diverticula remains a significant challenge. The aim of this case report was to offer an alternative technique using a foley catheter guided by semi-rigid ureterorenoscopy to facilitate bladder diverticulum identification during laparoscopic diverticulectomy.

CASE DESCRIPTION
A 77-year-old male patient presented with complaints of burning sensation during urination and reported frequent episodes of urinary tract infection over the past several months. Cystographic imaging revealed a large diverticulum located on the left posterior bladder wall. Non-contrast abdominal computed tomography (CT) scan identified a 10×10 mm calculus in the left inferior renal calyx. The patient was diagnosed with a bladder diverticulum. Subsequently, laparoscopic transperitoneal diverticulectomy was performed using a foley catheter guided by semi-rigid ureterorenoscopy for diverticulum identification and excision. The procedure commenced with cystoscopy to localize the diverticulum. Four trocars were inserted: two 12 mm and two 5 mm. A pneumoperitoneum pressure of 14 mmHg was maintained throughout the surgery. The diverticulum was clearly visualized during the operation, and excised successfully without injuring adjacent structures. Postoperative recovery was uneventful.

CONCLUSION
The use of a foley catheter guided by semi-rigid ureterorenoscopy may serve as an effective alternative for intraoperative identification of bladder diverticula, particularly in laparoscopic and resource-limited settings.

Keywords: Bladder diverticulum, foley catheter, laparoscopic, diverticulectomy, semi-rigid ureterorenoscopy, elderly male

INTRODUCTION

Bladder diverticulum refers to a protrusion of the bladder mucosal layer through the detrusor muscle.[1] This condition may be congenital or acquired, with acquired bladder diverticulum more frequently associated with bladder outlet obstruction.[1–3] Bladder diverticula are present in an estimated 15% of adult patients with lower urinary tract obstruction.[4] However, bladder diverticula are frequently asymptomatic and often diagnosed incidentally.[4,5] If left untreated, bladder diverticula can lead to complications such as recurrent infections, bladder stones, and bladder outlet obstruction, potentially resulting in renal damage or kidney failure.[5] Chronic infection and irritation also increase the risk of neoplastic transformation.[5] These complications can significantly impact the patient's quality of life and require timely surgical intervention to prevent further deterioration.

Treatment of bladder diverticula ranges from conservative monitoring to surgical excision, depending on symptom severity and associated complications.[6] Various surgical techniques have been employed, including open, endoscopic, laparoscopic, and robotic-assisted approaches.[7–10] Among these, the laparoscopic approach is increasingly favored due to its minimally invasive nature.[4] However, a critical limitation of laparoscopy lies in the challenge of accurately identifying the diverticulum intraoperatively, given the lack of tactile feedback and limited direct visualization, particularly in cases involving large diverticula. Furthermore, despite advancements in laparoscopic techniques, to date, precise intraoperative identification of diverticula remains a significant challenge, particularly in avoiding injury to adjacent structures such as the ureter. Precise identification of the diverticulum is essential to ensure complete excision while minimizing the risk of injury to adjacent structures. Several methods have been described to aid in diverticulum localization, including the use of balloon catheters, endoscopic light guidance, and cystoscopic techniques.[10–14] These methods, however, often rely on flexible endoscopic equipment or advanced instrumentation that may not be readily available in all clinical settings. There remains a need for a simple, effective, and widely applicable method for diverticulum identification, particularly in resource-limited settings.

Semi-rigid ureterorenoscopy is a cost-effective and widely available tool suitable for resource-limited settings. Its rigid structure allows reliable navigation and visualization, making it practical for identifying bladder diverticula without the need for advanced equipment. The aim of this case report was to offer an alternative technique using a foley catheter guided by semi-rigid ureterorenoscopy to facilitate bladder diverticulum identification during laparoscopic diverticulectomy. The proposed method offers a practical solution in settings with limited access to flexible endoscopic tools, while maintaining operative safety and effectiveness.

CASE REPORT

Patient information and clinical presentation

A 77-year-old male patient presented to the Urology Outpatient Clinic of Banyumas Hospital, Banyumas, Indonesia, with complaints of burning sensation during urination and frequent episodes of UTIs over the past several months. Additionally, the patient experienced difficulty in fully emptying the bladder and had an increased frequency of urination, particularly at night, which disrupted sleep. The patient had a history of transurethral resection of the prostate (TURP) performed several years prior. Despite self-administered antibiotic treatment, the symptoms had persisted, prompting the patient to seek further medical management.

Diagnostic assessment

The patient's vital signs were within normal limits: blood pressure 130/80 mmHg, heart rate 78 beats per minute, respiratory rate 18 breaths per minute, temperature 36.8°C, and oxygen saturation 98% in room air. Physical examination was unremarkable. Laboratory analysis of the urine revealed leukocyturia, quantified at 120 cells per high-power field, leading to further diagnostic investigations for possible bladder pathology. Cystographic imaging revealed a large diverticulum located on the left posterior bladder wall (**Figure 1**). Non-contrast abdominal computed tomography (CT) scan identified a 10×10 mm calculus in the left inferior renal calyx. Based on a comprehensive history, physical examination, and supporting diagnostic tests, the patient was diagnosed with a bladder diverticulum.

Figure 1. Cystographic imaging (Left: anteroposterior view; Right: lateral view) demonstrating a large bladder diverticulum located at the left posterolateral aspect of the bladder

Surgical intervention

Subsequently, laparoscopic transperitoneal diverticulectomy was performed using a foley catheter guided by semi-rigid ureterorenoscopy for diverticulum identification and excision. Under general anesthesia, the patient was positioned in the dorsal lithotomy position. Cystoscopy demonstrated moderate bladder trabeculation and a diverticulum at the superolateral aspect near to the left ureteral orifice. A double J (DJ) stent was placed in the left ureter to serve both as a landmark during surgery and to facilitate subsequent retrograde intrarenal surgery (RIRS) for the renal stone. A 14 Fr foley catheter was then inserted into the bladder. The 8 Fr semi-rigid ureterorenoscope was inserted through the urethra alongside the catheter to further guide the placement of the catheter with the aid of grasper forceps into the bladder diverticulum. (**Figure 2A**). The balloon of the foley catheter was inflated with 60 mL of saline once it was appropriately positioned within the diverticulum with direct visualization from ureterorenoscopy to prevent misplacement of the balloon during filling (**Figure 2B** and **Figure 3**). After ensuring proper position of balloon catheter, the ureterorenoscope was removed from the bladder. Subsequently, a laparoscopic diverticulectomy was performed via a transperitoneal approach. The patient was repositioned in the Trendelenburg and lithotomy positions (**Figure 2C**). Two 12 mm trocars and two 5 mm trocars were inserted using a direct access technique (**Figure 2D**). Pneumoperitoneum was established and maintained at 14 mmHg. The inflated foley balloon facilitated the identification of the diverticulum (**Figure 2B**). The diverticulum was excised at its neck and carefully dissected from surrounding tissues, with particular attention to the ureter. The resulting defect was closed in a single layer using 3-0 V-Loc™ barbed sutures. An intraperitoneal drain was placed. The total operative time was 5 hours and 32 minutes, with minimal blood loss. No intraoperative injuries to the ureter or other intraperitoneal organs were observed. At the conclusion of the procedure, a 22 Fr two-way foley catheter was placed to ensure adequate postoperative bladder drainage.

Postoperative course

The patient was hospitalized for a duration of three days post-operatively. During the hospitalization, the intraperitoneal drain was removed prior to discharge, and the foley catheter was maintained for a two-week period to ensure proper bladder drainage and prevent complications. Upon discharge, the patient was advised to continue monitoring urinary function and report any changes.

Follow-up

At the three-month follow-up, the patient reported a complete resolution of previous symptoms. There were no complaints of dysuria, recurrent urinary tract infections, or other urinary issues. Urinalysis conducted during the follow-up demonstrated no signs of infection, further confirming the success of the procedure.

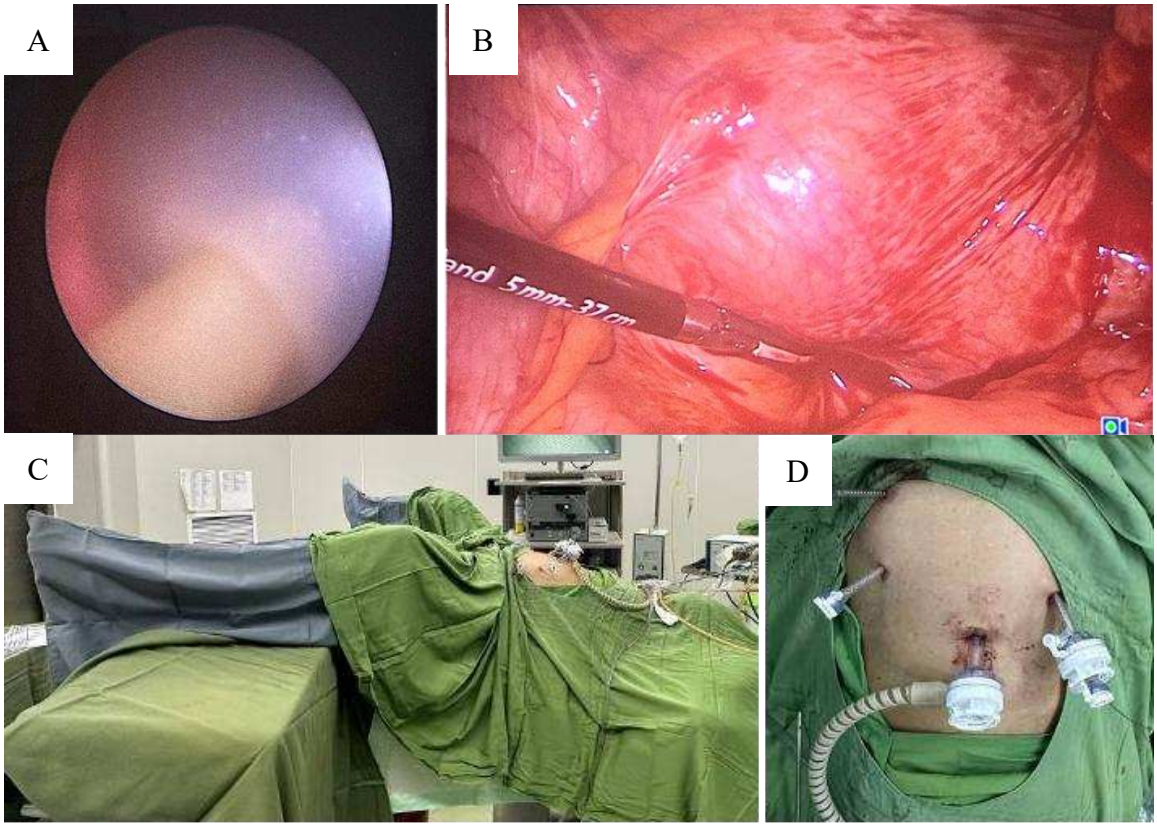

Figure 2. Intraoperative steps and setup of the laparoscopic transperitoneal diverticulectomy procedure using a semi-rigid ureterorenoscope: A) Insertion and balloon inflation of a foley catheter into the diverticulum under direct visualization using a semi-rigid ureterorenoscope; B) Intraoperative identification and stabilization of the diverticulum during laparoscopic excision; C) Patient positioned in the lithotomy and Trendelenburg positions for laparoscopic transperitoneal diverticulectomy; D) Port placement consisting of two 12 mm and two 5 mm trocars

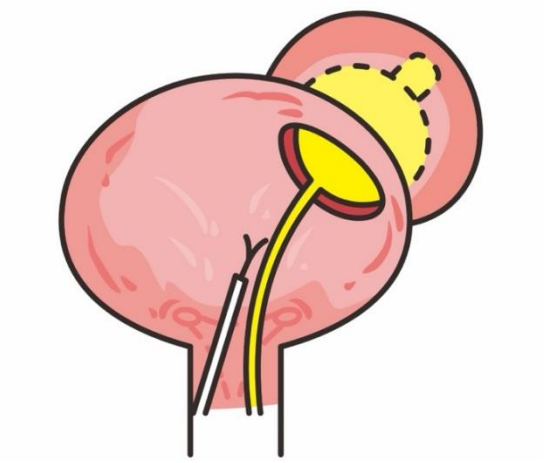

Figure 3. An illustration depicting laparoscopic transperitoneal diverticulectomy procedure using a semi-rigid ureterorenoscope, wherein a 14 Fr foley catheter is inserted into the bladder diverticulum and guided into position using ureterorenoscopic forceps, with the placement and expansion of the catheter's balloon visualized directly under semi-rigid ureterorenoscopic guidance

DISCUSSION

In limited-resource hospital settings, the surgical management of bladder diverticulum—particularly via laparoscopy—remains challenging due to limited access to advanced imaging or navigation technologies. Accurate intraoperative localization of the diverticulum is essential to avoid injury to surrounding structures and minimize operative time. However, in the absence of real-time image guidance tools, this step can be time-consuming and technically demanding. This case report presents a practical and cost-effective alternative using a foley catheter guided by semi-rigid ureterorenoscopy to facilitate precise identification of the diverticulum during laparoscopic diverticulectomy. This technique not only enhances intraoperative visibility but also streamlines the dissection process, potentially reducing surgical time and improving safety in resource-constrained environments.

Accurate intraoperative localization of the diverticulum is a critical step in achieving successful resection. However, this can be challenging, especially in cases where the diverticulum is small, anatomically complex, or obscured by surrounding structures. These challenges are amplified in resource-limited settings, where access to advanced imaging tools or flexible endoscopy may be restricted. Traditionally, diverticulectomy has been performed through open or laparoscopic approaches, often with the aid of cystoscopic transillumination, guidewires, or contrast injection for intraoperative identification.[13] While effective, these techniques may require additional equipment and expertise, limiting their feasibility in certain healthcare environments.

The present case highlights a simple yet effective technique involving the use of a semi-rigid ureterorenoscope to guide the placement of a foley catheter into the diverticulum. Under direct vision with a semi-rigid ureterorenoscope, the foley catheter was inserted into the diverticulum using grasping forceps. Semi-rigid ureterorenoscopy provided accurate catheter placement and contributed to reduced operative time. This technique presents a practical alternative in facilities where flexible ureteroscopes or cystoscopes are not available. Although similar methods have been reported using council catheters guided by flexible cystoscopy and stiff wires, the present approach differs conceptually.[11,14] In the council catheter technique, the diverticulum is delineated by filling it with fluid.[15] In contrast, the current method employed a fully inflated foley catheter balloon, which offered direct visualization and enhanced stability of the catheter position within the diverticulum. More detail related to the technique used for identification of bladder diverticulum from the literature is summarized in Table 1.

Balloon catheter inflation for diverticulum identification has been previously described, primarily in laparoscopic diverticulectomy settings.[15] One limitation of this technique is its reduced effectiveness in cases of wide-neck diverticula, due to the limited expansion capacity of the balloon. Various modifications of this technique have been proposed, including the use of a balloon constructed from a ureteral catheter introduced via a nephroscope or cystoscope. In the present case report, semi-rigid ureteroscopy was utilized to directly visualize and guide the placement of a catheter into the bladder diverticulum using forceps. This technique may serve as a practical alternative in resource-limited settings where advanced equipment is not readily available. Regardless of whether balloon inflation or fluid instillation is used, the goal remains to stabilize the diverticulum, allowing for controlled expansion and reducing the risk of injury to surrounding structures. However, identifying large or anatomically complex diverticula continues to pose challenges due to limitations in balloon size and access angles.[11] Endoscopic light guidance remains another option for localization in selected cases.[16,17]

Table 1. Comparison of case reports with the present case

Reported by	Age of patient	Sex	Bladder diverticulum identification method	Clinical manifestation	Therapy
Rebouças et al.[16]	37 years	Female	Cystoscopy + Ultrasonography + Transillumination	Recurrent urinary tract infection	Laparoscopic bladder diverticulectomy assisted by cystoscopy
Juan et al.[15]	85 years	Male	Cystoscopy + Cystogram + Transillumination	Dysuria, pain on micturition, cloudy urine	Laparoscopic transperitoneal bladder diverticulectomy
Giannarini et al. [17]	Median 68 years	Male	Saline injection ± Flexible cystoscopy ± Firefly technology	High postvoid residual, recurrent UTI, diverticular stones	Robot-assisted transperitoneal extravesical bladder diverticulectomy
This report	77 years	Male	Foley catheter balloon guided by semi-rigid ureterorenoscopy	Burning sensation during urination and frequent episodes of UTIs	Laparoscopic transperitoneal bladder diverticulectomy

An additional consideration when using a foley catheter during diverticulectomy is the challenge of continuous bladder drainage. Wan et al.[11] described a transperitoneal laparoscopic diverticulectomy technique incorporating cystostomy for urine drainage while concurrently using a urinary catheter for diverticulum identification. The inclusion of cystostomy enables controlled bladder filling to assess for leakage following suturing. Alternatively, bladder drainage may be achieved with a small-caliber nasogastric tube inserted alongside the foley catheter via the urethra, thus maintaining bladder decompression without interfering with diverticulum localization.

Compared to previously reported techniques,[15] our method offers several advantages. It is less reliant on specialized equipment, minimizes operative time by facilitating diverticulum identification, and may reduce the risk of injury to adjacent structures. The combination of ureterorenoscopic visualization and balloon inflation proved both safe and effective in this case. However, this case is limited by its single-patient design and the short duration of follow-up. Further studies involving larger patient cohorts and long-term outcomes are necessary to confirm the generalizability and reproducibility of this approach. Nevertheless, the findings presented here contribute to the evolving field of minimally invasive urology and may guide surgical practice in resource-constrained settings.

CONCLUSION

The use of a foley catheter guided by semi-rigid ureterorenoscopy offers a practical and safe method for intraoperative identification of bladder diverticula, particularly in moderate-sized lesions. Its simplicity and reliance on standard equipment make it a valuable alternative in healthcare settings with limited access to advanced endoscopic tools.

Ethical Approval

Written informed consent was obtained from the patient prior to the surgical procedure, including authorization for the intervention as well as approval for the collection, analysis, and dissemination of clinical data in an anonymized manner for research and academic purposes.

Conflict of Interest

All the authors declare that there are no conflicts of interest.

Acknowledgement

The authors extend their gratitude to the urological surgical team at Banyumas Hospital, Banyumas, Indonesia, for their expertise and contributions to the surgical management of the patients in this case report.

Author Contributions

MKYW: conceptualizing, validation, writing–original draft preparation, review, and editing, funding acquisition; AZH: validation, supervision, writing–review, and editing; ES: Doing the operation, review and validation. All authors have read and approved the final version.

Funding

This case report received no external funding.

Data Availability Statement

Derived data supporting the findings of this case report are available from the corresponding author on request.

Declaration the Use of Artificial Intelligence in Scientific Writing

This study used artificial intelligence (AI) tool and methodology of which AI-based language model ChatGPT was employed in the language refinement (improving grammar, sentence structure, and readability of the manuscript). We confirm that all AI-assisted processes were critically reviewed by the authors to ensure the integrity and reliability of the results. The final decisions and interpretations presented in this article were solely made by the authors.

REFERENCES

1. Abou Zahr R, Chalhoub K, Ollaik F, Nohra J. Congenital bladder diverticulum in adults: a case report and review of the literature. Case Rep Urol 2018;2018:9748926. doi: 10.1155/2018/9748926.
2. Ho MC, Hashim H. Surveillance and management of bladder diverticulum in the setting of bladder outlet obstruction. Curr Bladder Dysfunct Rep 2022;17:234–40. doi: 10.1007/s11884-022-00664-5.

3. Kim S, Park SH, Kim DY, Yun SJ, Lee OJ, Han HS. Bilateral obstructive uropathy caused by congenital bladder diverticulum presenting as hypertensive retinopathy. J Korean Med Sci 2018;33:e54. doi: 10.3346/jkms.2018.33.e54.
4. Geavlete PA, Georgescu D, Drăguţescu M, Geavlete B. Endoscopic approach to bladder diverticula. In: Geavlete PA, editor. Endoscopic diagnosis and treatment in urinary bladder pathology. London: Elsevier; 2016. pp. 257–75.
5. Zhu GG, Siegel CL, Rogers DM, et al. Urinary bladder diverticula: imaging features and complications. Abdom Radiol (NY) 2025. doi: 10.1007/s00261-024-04714-w.
6. Sivakov AA, Protoshchak VV, Gozalishvili SM, et al. Diagnostika i lechenie divertikulov mochevogo puzyrya. [Diagnostics and treatment of bladder diverticula]. Urol Rep (St.Petersburg). 2023;13:177–85. doi: https://doi.org/10.17816/uroved508768. Russian.
7. Sengupta S, Basu S, Gupta S. An insight into the management of urinary bladder diverticulum: a retrospective observational study. Int J Adv Med 2020;7:1820-24. doi: 10.18203/2349-3933.ijam20205041.
8. Ge G, Wang H, Zheng Q, Zhang S, Wang H, Ma L. Case report: robot-assisted laparoscopic bladder diverticulectomy: a case series and initial experience. Front Surg 2025;11:1453883. doi: 10.3389/fsurg.2024.1453883.
9. Liu S, Pathak RA, Hemal AK. Robot-assisted laparoscopic bladder diverticulectomy: adaptation of techniques for a variety of clinical presentations. Urology 2021;147:311–6. doi: 10.1016/j.urology.2020.07.044.
10. Pettet D 3rd, Smilios C, Nelson M. Where did that catheter go? A case report of Foley catheter placement in bladder diverticulum with point-of-care ultrasound. JEM Reports 2022;1:100001. doi: 10.1016/j.jemrpt.2022.100001.
11. Wan Z, Wang Y, Li C, Zheng D. One-stage laparoscopy combined with resectoscope in the treatment of huge bladder diverticulum, multiple stones in diverticulum, multiple stones in bladder and benign prostatic hyperplasia: a case report. Front Med (Lausanne) 2022;9:1036222. doi: 10.3389/fmed.2022.1036222.
12. Gibson D, Shanmugasundaram R, McClintock G, et al. Robotic-assisted bladder diverticulectomy: indications, technique, and outcomes—a case series. J Endourol 2024;38:1013–20. doi: 10.1089/end.2024.0209.
13. Eredics K, Rauchenwald M, Lusuardi L, et al. The feasibility, technique, and medium-term follow-up of laparoscopic transvesical diverticulectomy. Urol Int 2020;104:923–7. doi: 10.1159/000510242.
14. Develtere D, Mazzone E, Berquin C, et al. Transvesical approach in robot-assisted bladder diverticulectomy: surgical technique and outcome. J Endourol 2022;36:313–6. doi: 10.1089/end.2021.0366.
15. Juan YS, Li CC, Shen JT, et al. Laparoscopic bladder diverticulectomy for large bladder diverticulum: a case report. Kaohsiung J Med Sci 2004;20:563–6. doi: 10.1016/s1607-551x(09)70259-1.
16. Rebouças RB, Monteiro RC, Souza TN, et al. Laparoscopic bladder diverticulectomy assisted by cystoscopic transillumination. International Braz J Urol 2014;40: 281-2. doi: 10.1590/S1677-5538.IBJU.2014.02.22.
17. Giannarini G, Rossanese M, Macchione L, Mucciardi G, Crestani A, Ficarra V. Robot-assisted bladder diverticulectomy using a transperitoneal extravesical approach. Eur Urol Open Sci 2022;44:162-8. doi: 10.1016/j.euros.2022.08.016.