



Management of multiple giant bladder diverticula: a comprehensive approach – a case report

Wael Gazzah, MD*, Souheil Ben Taher, MD, Sedki Masmoudi, MD, Mahmoud Hamza, MD, Sahbi Naouar, MD, Braiek Salem, MD

Introduction and importance: Bladder diverticula are commonly due to obstruction of the bladder outlet and are typically treated conservatively. However, the rarity and complexity of multiple giant diverticula require a tailor-made surgical approach.

Case presentation: We report on a 72-year-old male who presented with severe urinary symptoms and lumbar pain, diagnosed with multiple giant bladder diverticula, including one compressing the ureter. The complex presentation of the patient, including his age and comorbidities, added layers of complexity to the clinical decision-making process.

Interventions and outcomes: The patient underwent a two-stage surgery consisting of transurethral prostate resection followed by resection of three diverticula. Postoperatively, the patient showed a remarkable improvement in urinary symptoms, resolution of hydronephrosis, and, more importantly, no complications, demonstrating the efficacy and safety of the surgical strategy chosen.

Relevance and impact: This case underscores the challenges in managing complex bladder diverticula, highlighting the importance of personalized treatment strategies and further research in atypical urological conditions. Furthermore, this case highlights the need to increase awareness and research on rare urological conditions. By sharing detailed insights from this case, we aim to enrich the clinical knowledge base, ultimately improving patient outcomes in similar challenging scenarios.

Keywords: bladder diverticula, case report, diagnostic imaging, surgical management, urology

Introduction

Bladder diverticula are common urological conditions, characterized by the protrusion of the urothelium through the muscle fibers of the bladder wall, resulting in pouch-shaped structures. These typically form due to increased intravesical pressure and concurrent weakness in the bladder wall^[1]. Although bladder diverticula are a frequent clinical encounter, the manifestation of multiple giant bladder diverticula is extraordinarily rare, presenting significant diagnostic and therapeutic dilemmas.

The literature reports that patients with bladder diverticula frequently have a range of urinary symptoms, including difficulty voiding and recurrent urinary tract infections (UTIs)^[2]. Advanced diagnostic tools, particularly computed tomography (CT) scans, play a crucial role in identifying these anomalies by providing

HIGHLIGHTS

- An unusual case of multiple giant bladder diverticula required specialized surgery.
- The patient, 72, had severe symptoms due to a diverticulum compressing the ureter.
- Treatment included catheterization, antibiotics, and prostate and diverticula resection.
- Post-surgery, the patient had improved urinary function without complications.
- The case highlights the need for personalized care and research in complex urological issues.

detailed information on the size, number, and potential complications associated with the diverticula.

In terms of management, surgical intervention often becomes necessary, especially when the diverticula is large, symptomatic, or associated with complications. The existing body of research suggests that, although conservative treatments may suffice for smaller asymptomatic diverticula, complex cases, such as those involving multiple giant diverticula, require a more aggressive surgical approach^[3].

This report details a rare case of multiple giant bladder diverticula, elaborating on its clinical presentation, diagnostic evaluation, and surgical management. In this case, our objective is to highlight the critical need for tailored surgical strategies in the management of such unusual and challenging presentations. Furthermore, we discuss the importance of a comprehensive approach in the field of urology in recognizing and effectively treating atypical bladder diverticula, thus enriching current understanding and treatment paradigms.

Department of Urology, Faculty of Medicine, University of Sousse, Ibn El Jazzar Hospital, Kairouan, Tunisia

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

*Corresponding author. Address: Department of Urology, University of Sousse, Ibn El Jazzar Hospital, Kairouan 3100, Tunisia. Tel.: +216 55 983 299. E-mail: waelgazzah@gmail.com (W. Gazzah).

Copyright © 2024 The Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

Annals of Medicine & Surgery (2024) 86:4187–4190

Received 12 March 2024; Accepted 3 May 2024

Published online 15 May 2024

<https://dx.doi.org/10.1097/MS9.0000000000002162>

Case presentation

Patient information and clinical presentation

A 72-year-old male patient with a significant medical history of benign prostatic hyperplasia and recurrent urinary tract infections presented with a recent exacerbation of lumbar pain and severe urinary retention. The patient described the pain as persistent and worsening, significantly impacting his daily activities. A clinical examination revealed a palpable, firm mass in the hypogastrium. Rectal examination confirmed an enlarged prostate, estimated at 40 g, consistent with his known history of prostatic hypertrophy.

Diagnostic assessment

Laboratory tests indicated elevated renal function (creatinine: 240 $\mu\text{mol/l}$) and normal white and red blood cell counts. Urinalysis returned positive for *Escherichia coli*, which was sensitive to cefotaxime. Pelvic and retroperitoneal ultrasound examinations revealed multiple bladder diverticula, the largest being a posterior diverticulum measuring 12 cm \times 6 cm \times 8 cm. Additional findings included significant postvoid residual volume and unilateral right hydronephrosis with increased parenchymal echogenicity. CT imaging confirmed the presence of multiple giant bladder diverticula, with one compressing the right ureter and causing dilation of the renal cavity (Fig. 1).

Initial management

The patient's acute presentation was managed with immediate bladder catheterization, which drained 4000 ml of cloudy urine and temporarily relieved the obstructive symptoms. Concurrent antibiotic therapy was initiated, which led to improvement in renal function and resolution of the infection, stabilizing the patient's condition and preparing him for definitive surgical intervention.

Surgical intervention

Given the complexity of the bladder diverticula and the patient's comorbidities, a comprehensive two-stage surgical approach was executed within a single operative session to minimize the risks associated with multiple surgeries. The initial stage involved a transurethral resection of the prostate (TURP) aimed at

addressing the underlying benign prostatic hyperplasia, which contributed to the patient's bladder outlet obstruction and was a predisposing factor for the diverticula formation.

Immediately following the TURP, the surgical team proceeded with the second stage. A subumbilical laparotomy was performed to provide optimal exposure to the bladder. A vesical incision was made, allowing precise localization and stenting of the ureteral orifices. The most significant intervention involved the meticulous resection of three large diverticula, including the notably large posterior diverticulum that was compressing the right ureter and contributing to hydronephrosis. The necks of the excised diverticula were closed using a double-layer suturing technique to ensure a robust and watertight closure, thus preventing potential complications such as leakage or recurrence (Figs 2, 3).

To monitor and manage postoperative fluid accumulation and ensure proper healing, a surgical drain was placed at the end of the procedure. The drain was carefully monitored and maintained until it was deemed safe for removal, which occurred on the fifth postoperative day when clear signs of recovery were evident and the risk of complications like seroma or infection was minimized.

Postoperative course

The patient's postoperative course was uneventful. Follow-up consultations showed the patient to be satisfied, with improved urinary function and stable renal function.

Follow-up

At 6 months of follow-up, there were no complications or recurrence of the condition and no residual urine was observed after the void.

Discussion

Mechanism of formation of the bladder diverticulum

Bladder diverticula are characterized by the protrusion of the urothelium through the muscular wall of the bladder, forming an extraneous sac^[1]. Typically, this sac lacks muscular coverage, which impairs its effectiveness in urine removal. Although often clinically insignificant, certain cases can lead to persistent lower urinary tract symptoms (LUTS), recurrent urinary tract infections (UTIs), bladder stones^[4], and even a potential for malignant

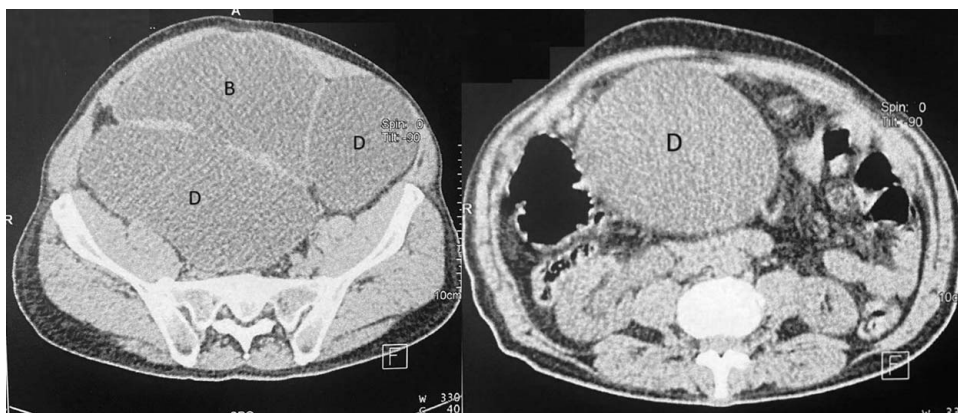


Figure 1. Computed tomography scan showing three giant bladder diverticula with compression of the right ureter (B, bladder, D, diverticulum).

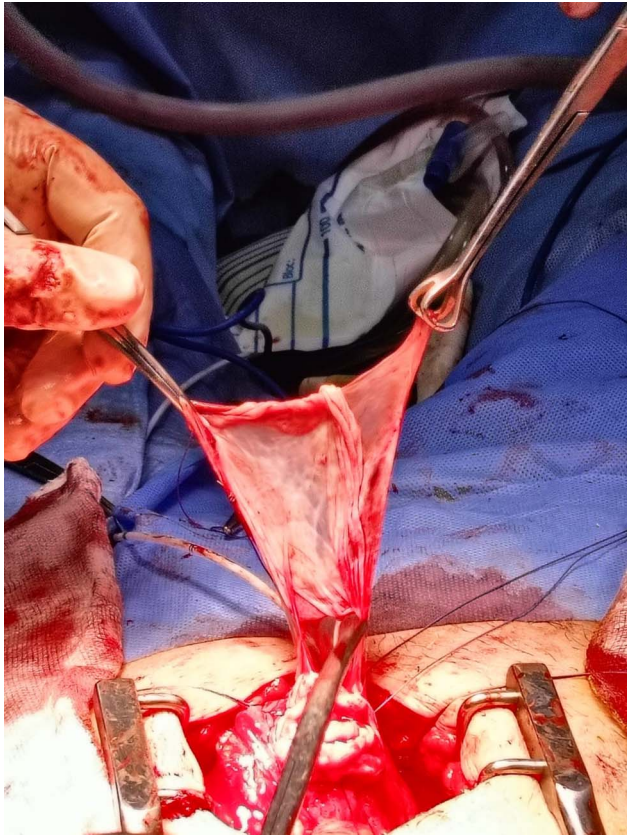


Figure 2. Intraoperative image showing dissection of the diverticulum mucosa.

transformation^[5]. These complications arise primarily from disrupted urinary function, particularly problems with detrusor muscle coordination and contraction. Studies suggest that the risk of cancerous changes in bladder diverticula ranges from 1 to 10%, necessitating surgical intervention in cases that could otherwise be considered dormant^[5].

Bladder diverticula are often associated with bladder outlet obstruction (BOO), and many patients experience improvement after treatments aimed at this obstruction^[6]. This association is due to the fact that BOO leads to a chronic elevation of bladder pressures, which in turn promotes diverticula formation by exacerbating the inherent weaknesses in the bladder wall^[7]. Comprehensive evaluations, including endoscopy, imaging, and urodynamic studies, are crucial to guide patients before considering surgical intervention. Furthermore, the development



Figure 3. An image showing the resected wall of the diverticula.

of a diverticulum often results from increased internal pressures due to low bladder compliance, and the presence of a diverticulum can further exacerbate this condition, creating a feedback loop that worsens LUTS^[5]. This feedback mechanism highlights the importance of timely diagnosis and management to prevent progression and complications.

Diagnostic techniques

Diverticula are detectable using imaging techniques such as ultrasound, CT, and magnetic resonance imaging (MRI)^[11]. Each of these modalities offers unique advantages; ultrasound provides a quick, non-invasive first look, CT scans offer detailed anatomical views, and MRI provides excellent soft tissue contrast without radiation exposure. A voiding cystourethrogram is particularly effective in diagnosing the diverticula of the bladder, allowing clear visualization of the relationship between the ureteral orifice and the diverticulum's opening, as well as its size^[8]. This technique is crucial for evaluating bladder functionality and the impact of diverticula on urine flow. These diagnostic tools are indispensable for the accurate identification and assessment of bladder diverticula, especially in complex cases such as the one presented in this report. Furthermore, endoscopic examination not only complements these imaging studies by providing a direct view of the interior of the bladder but also allows therapeutic interventions if needed^[11].

Surgical techniques for the management of bladder diverticulum

Various surgical approaches are available to treat bladder diverticula, including transabdominal methods, either extraperitoneal or intraperitoneal. These procedures can be performed using open surgery, laparoscopy, or robotic-assisted methods, each offering different advantages in terms of invasiveness, recovery time, and precision^[6,9]. For patients who are not suitable candidates for extensive surgery, an endoscopic approach involving fulguration or resection can be considered^[10]. Endoscopic techniques are less invasive and can be particularly beneficial for patients with high surgical risk or those with smaller and less complicated diverticula.

The primary surgical strategy involves dissecting near the diverticulum wall, with meticulous repair of any defects in the bladder muscle. Often, reflux or involvement of the ureteral meatus is associated with the diverticulum, requiring homolateral ureteral reimplantation. In cases of bilateral reflux, bilateral ureteral reimplantation may be indicated^[10]. Such interventions are crucial in preventing future complications, such as recurrent infections or worsening renal function. In our case, the patient with a giant bladder diverticulum experienced significant lower urinary tract symptoms (LUTS). We opted for an intravesical surgical approach, which resulted in an uncomplicated post-operative recovery and excellent long-term results.

This case report of multiple giant bladder diverticula illuminates the intricate and diverse nature of urological anomalies that physicians may encounter. It underscores the crucial role of thorough diagnostic evaluations in identifying such complex conditions. Effective surgical management requires a customized approach that considers both the anatomical challenges and the general health status of the patient. The effectiveness of customized surgical strategies, as demonstrated in this case, is crucial in the treatment of these rare and elaborate urological presentations. Our experience with this particular case not only sheds light

on the challenges posed by atypical bladder diverticula but also emphasizes the importance of personalized patient care.

Furthermore, this case serves as a testament to the necessity for continuous research and scholarly discourse in urology. It highlights the need to refine and advance diagnostic techniques and treatment modalities, especially for unusual presentations of bladder diverticula. Such advances are essential to improve patient outcomes and expand our understanding of urological pathologies.

SCARE Guidelines: The work has been reported in line with the SCARE (Surgical CAse REport) criteria^[11].

Conclusion

The successful treatment of this case of multiple giant bladder diverticula not only reaffirms the importance of personalized medical approaches but also underscores the ongoing need for innovation and exploration in the field of urological care. This case illustrates the complexity of bladder diverticula management and the critical role of surgical strategies adapted to the unique anatomical and clinical characteristics of each patient. By overcoming the challenges presented by this rare and complex condition, we highlight the potential for improved outcomes through meticulous planning and execution of surgical interventions.

Furthermore, this experience emphasizes the need for continuous advancement in diagnostic and surgical techniques. The topic prompts the call for further research on the pathophysiology of bladder diverticula and the development of new methodologies that can improve diagnostic precision and treatment efficacy. Ultimately, our case contributes to the broader discourse on how urological care can evolve, with the goal of providing more effective, less invasive, and highly personalized treatment options for patients with complex urological conditions.

Ethical approval

Not applicable.

Consent

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images. A copy of the written consent form is available for review by the Editor-in-Chief of this journal upon request.

Patient perspective

Successful surgical intervention in this case of multiple giant bladder diverticula significantly improved the patient's quality of life, effectively alleviating his pain and resolving his urinary problems. After surgery, the patient reported a marked reduction in discomfort and an improved ability to perform daily activities, which had been markedly hampered by his symptoms prior to treatment. This improvement underscores the impact of tailored surgical strategies not only on clinical outcomes but also on patient satisfaction and quality of life. The patient expressed gratitude for the restored function and relief from chronic symptoms, illustrating the profound personal benefits of successful medical intervention in complex urological conditions.

Sources of funding

Not applicable.

Author contribution

All authors have contributed equally to the work reported in this manuscript, including the conception, design, execution, data acquisition, analysis and interpretation, and the drafting and revising of the manuscript for important intellectual content.

Conflicts of interest disclosure

The authors declare that they have no conflicts of interest concerning this article.

Research registration unique identifying number (UIN)

Not applicable.

Guarantor

Wael Gazzah.

Data availability statement

The datasets are available from the corresponding author on reasonable request.

Provenance and peer review

Not commissioned, externally peer-reviewed.

References

- [1] Abou Zahr R, Chalhoub K, Ollaik F, *et al.* Congenital bladder diverticulum in adults: a case report and review of the literature. *Case Rep Urol* 2018;2018:9748926.
- [2] Han Z, Sun X, Ma X, *et al.* Bladder diverticulum accompanied by abdominal pain: a case description. *Quant Imaging Med Surg* 2024;14:1215–8.
- [3] Wu D, Dai R, Zheng S. Management of a large urinary bladder diverticulum with an open extravesical diverticulectomy. *Asian J Surg* 2023;46:2164–5.
- [4] Gazzah W, Mansi Z, Zaidi B. Contraceptive complication: emergence of a bladder stone - a case report. *Int J Surg Case Rep* 2024;118:109622.
- [5] Tan S, Sakaria S. Bladder diverticulum - a case report. *J Educ Teach Emerg Med* 2020;5:V15–8.
- [6] Janardanan S, Nigam A, Moschonas D, *et al.* Urinary bladder diverticulum: a single-center experience in the management of refractory lower urinary symptoms using a robotic platform. *Cureus* 2023;15:e42354.
- [7] Celebi S, Kuzdan Ö, Özeydin S, *et al.* The effect of bladder diverticula on bladder function: an experimental study in rabbits. *J Pediatr Surg* 2016;51:1538–42.
- [8] Jiang S, Ren Q, Wang X, *et al.* A huge bladder diverticulum in an elderly: a case report. *SAGE Open Med Case Rep* 2020;8:2050313X2094347.
- [9] Giannarini G, Rossanese M, Macchione L, *et al.* Robot-assisted bladder diverticulectomy using a transperitoneal extravesical approach. *Eur Urol Open Sci* 2022;44:162–8.
- [10] Zhengqiang W, Yinglei W, Cheng L, *et al.* 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* 2022;9:1036222.
- [11] Sohrabi C, Mathew G, Maria N, *et al.* Collaborators. The SCARE 2023 guideline: updating consensus Surgical CAse REport (SCARE) guidelines. *Int J Surg Lond Engl* 2023;109:1136–40.