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Inflammation and infection

Emphysematous pyelonephritis due to *Candida albicans* in a diabetic patient: A case reportAvin Mabadi<sup>a</sup>, Effat Davoudi-Monfared<sup>b</sup>, Arash Jafarieh<sup>c</sup>, Pershang Nazemi<sup>d,\*</sup><sup>a</sup> Yas Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran<sup>b</sup> Department of Clinical Pharmacy, Yas Hospital Complex, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran, Iran<sup>c</sup> Department of Anesthesiology and Critical Care, Yas Hospital Complex, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran<sup>d</sup> Department of Infectious Diseases, Yas Hospital Complex, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

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## ABSTRACT

Emphysematous pyelonephritis is an infection of the kidney tissue that is necrotizing and gas-producing and primarily affects individuals with diabetes mellitus. We have reported a 67-year-old female with a history of diabetes mellitus and prior urological procedures who developed emphysematous pyelonephritis due to *Candida albicans*. She was treated with systemic fluconazole and underwent other urological interventions as necessary. But due to persistent fever, irrigation of amphotericin B via nephrostomy was applied for three days after which her fever resolved. She finally recovered and was discharged in a healthy state. This case presentation underscores the complexity of managing fungal pyelonephritis.

## 1. Introduction

Emphysematous pyelonephritis (EP) is a serious and potentially life-threatening urinary tract infection that is characterized by necrosis and gas production in the kidney parenchyma.<sup>1</sup> The clinical presentation vary in severity and include non-specific symptoms like fever, nausea, and flank pain, known as diagnostic triad for EP.<sup>2</sup> Definitive diagnosis, however, relies on imaging studies i.e. computed tomography scan. The most remarkable risk factors are diabetes mellitus and female gender.<sup>2</sup> The condition carries a mortality rate of approximately 13 % and factors like sepsis, shock, decrease in level of consciousness, thrombocytopenia, etc. can increase the risk of mortality.<sup>3</sup>

Fungal EP is a rare etiology that is typically caused by candida species.<sup>4</sup> Limited data suggests that diabetes mellitus and female sex are prominent risk factors for fungal EP, like bacterial type.<sup>5,6</sup> We have presented a case of persistent fever, nausea, and flank pain with the diagnosis of EP. However, she didn't respond to routine management of EP such as antifungal, double J catheter insertion, and other supportive treatments. Subsequently, removal of catheter and irrigation of anti-fungal via nephrostomy resulted in improvement of her conditions.

## 2. Case

A 67-year-old female with a past medical history significant for diabetic mellitus, ischemic heart disease, chronic obstructive pulmonary disease, and hypertension originally presented with fever, chills, nausea, vomiting and irritative urinary symptoms and imaging in favor of moderate hydronephrosis, hydro urethra, and multiple kidney and ureteral stones in another hospital. She underwent transurethral lithotripsy by ureteroscopy and ureteral stent placement there. She developed signs of post-operative infection initially treated with broad spectrum IV antibiotics. She did not respond and updated cultures revealed yeast. That's why the patient was transferred to our tertiary hospital and admitted to the intensive care unit.

At the admission day (which is assumed as day 0), the initial assessment showed normal temperature and normal vital signs. The appearance of urine was purulent. Examination showed mild edema in lower limbs and left-sided costovertebral angle tenderness. However, the hemodynamic was stable. The initial laboratory results were indicative of normal white blood cells and high neutrophil ( $4.1 \times 10^9$  with 80 % polymorphonuclear cells), low hemoglobin (7.7 g/dL), low platelet count ( $128 \times 10^3/L$ ), and high serum creatinine (3.2 mg/dL). The patient was assessed by an Infectious disease (ID) specialist and inflammatory markers necessary cultures and PCR were requested and due to

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positive SIRS (Systemic Inflammatory Response Syndrome) Piperacillin-tazobactam 2.25 g stat and then three times daily, Vancomycin 1 g first, and 500 mg two times daily, and Fluconazole 200 mg stat and 200 mg daily was prescribed. Insulin was started to maintain blood sugars in an acceptable range (Glargin 8 IU daily and Aspart 4 IU three times daily before meals).

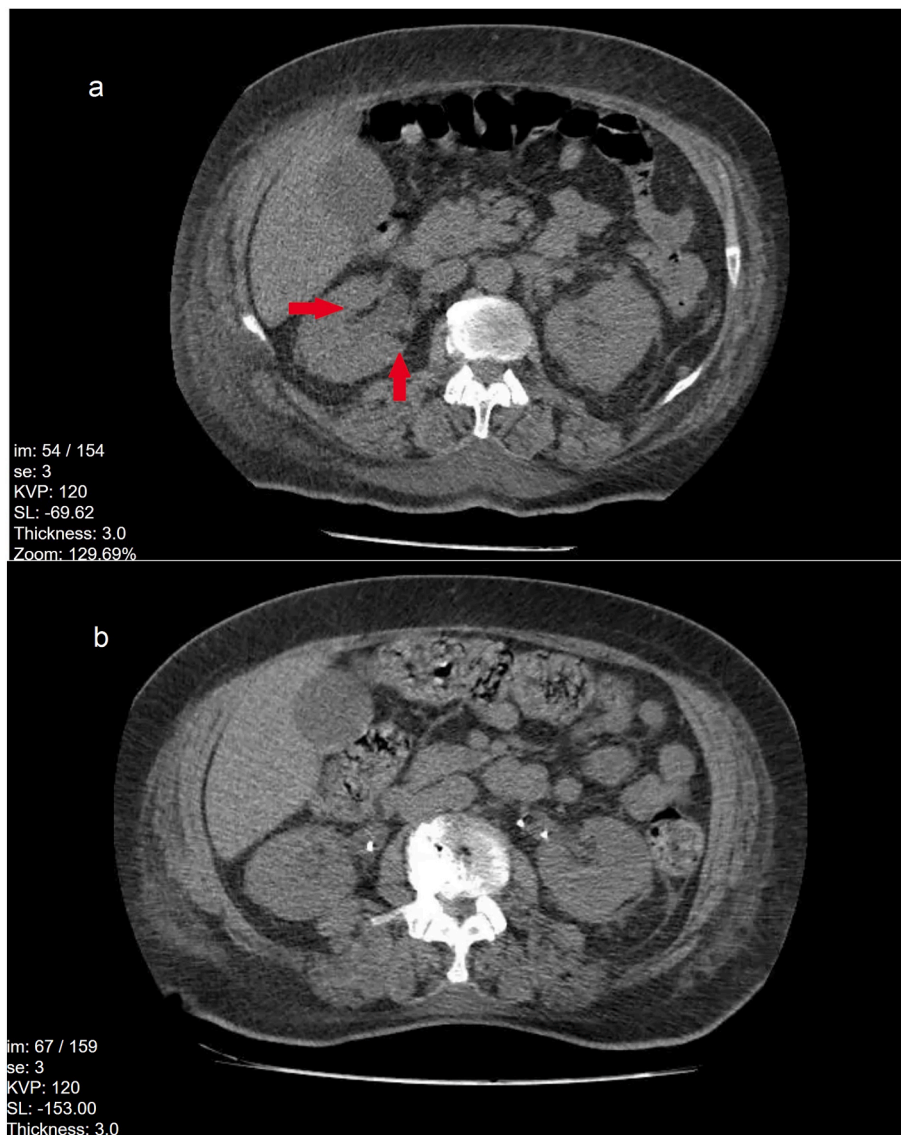
A computed tomography scan at admission revealed emphysematous pyelonephritis in both kidneys (Fig. 1). Ultrasound findings revealed bilateral mild hydronephrosis and a 6-mm renal stone in the left kidney and DJ was observed in proper position. Also, increased wall thickness and irregularity were observed in the bladder.

The shaking chills, sweating, and fever was continued and the inflammatory markers were in an increased level. Other microbiological assessment was negative and cardiology consult showed no signs of endocarditis. As the patient continued to be febrile, it was decided that the DJ catheter be replaced with another one and the old one was sent for microbiological and fungal assessment. The final susceptibility results revealed that the isolate was susceptible to fluconazole, itraconazole and amphotericin-B.

The patient was transferred to the ward on 5th day of admission. Treatment of fluconazole was continued and piperacillin-tazobactam

was stopped on day 10, after 10 days of treatment. Despite the initiation of antifungal treatment, the patient continued to experience persistent fever, prompting further investigation. Nephrostomy irrigation with amphotericin with the dose of 50mg/1000ml normal saline at a rate of 30 ml/hour was performed for a total of three days. This irrigation procedure was essential not only to directly target the resistant fungal infection within the nephrostomy site but also to alleviate the patient's ongoing symptoms and prevent further complications. The urine culture that was taken two days after instillation was negative and the fever and urinary symptoms started subsiding within one week.

After about two weeks of admission, the fever subsided but later recurred. A new urine culture showed the growth of vancomycin-resistant enterococcus. This necessitated a change in therapy to linezolid (600 mg intravenous two times daily) and continuation of fluconazole. The level of serum creatinine gradually decreased during her hospital admission. Inflammatory markers had the same trend. The urinary symptoms were almost disappeared. After 21 days of treatment, the patient showed clinical improvement, with negative cultures, and normal inflammatory markers. She was subsequently discharged in a stable condition. A further three-month follow-up showed she remained in stable condition, with regular visit for optimum control of her



**Fig. 1.** Results of computed tomography scan. a: initial imaging of the patient in favor of pyelonephritis in pelvic cuts and presence of gas in kidney parenchyma, b: resolution of emphysema in kidneys and decreasing in sizes in imaging after 42 days after completing treatment.

diabetes mellitus and urinary stones.

### 3. Discussion

Candida infections in the urogenital tract are among the most common isolates that can infect the bladder, urethral pathways, and kidney. However, transmission of Candida isolates to kidney tissue happens rarely.<sup>7</sup> In this case report, we presented a diabetic patient with candida pyelonephritis that was treated by both systemic and local antifungals. This underscores the necessity for enhanced infection control measures and surveillance systems to mitigate the risks associated with these pathogens.

The role of risk factors in the development of invasive Candida infections cannot be overstated. Immunocompromised patients, including those with malignancies, diabetes, or undergoing invasive procedures, are at a heightened risk.<sup>8,9</sup> Additionally, the overuse of broad-spectrum antibiotics in these populations has been linked to a disruption of normal flora, creating an environment conducive to opportunistic infections.<sup>8</sup> It is essential for healthcare providers to be aware of these risk factors and implement proactive strategies to prevent invasive candidiasis, particularly in vulnerable patient populations. The patient in the present report had diabetes mellitus like other investigations.<sup>5,7</sup>

The antifungal treatment landscape is rapidly evolving, yet challenges persist. Resistance to fluconazole and other first-line agents among non-albicans species has escalated, complicating treatment protocols.<sup>10</sup> Moreover, the duration of treatment for fungal infection is long, and persisting symptoms can be bothersome for patients. Sometimes, antifungal treatment or irrigation may not provide good response. Hussein Mohamed et al. reported the same case that was finally managed with unilateral nephrectomy. As our patient had persistent fever and the culture was positive repeatedly, the instillation of amphotericin into the catheter was tried for three days. This is a semi-invasive procedure that can help decrease in colonization of the fungus.<sup>11</sup> This procedure was not effective in decreasing symptoms immediately. However, the subsequent culture was negative and the symptoms subsided gradually.

The environmental impact of climate change on the epidemiology of invasive fungal infections has also been a growing concern. Rising global temperatures may alter the distribution and virulence of Candida species, potentially exacerbating the incidence of invasive infections.<sup>12</sup> This interplay between environmental factors and infectious diseases necessitates a comprehensive approach that includes monitoring climate impacts on public health and developing adaptable strategies to combat fungal infections in changing climates.<sup>12</sup>

### 4. Conclusion

As the pattern of antimicrobial use and prevalence of microorganisms and fungi is evolving, rare infections like candida pyelonephritis may have an increasing trend. This case highlights the critical need for innovative treatment strategies to address persistent infections, such as nephrostomy irrigation with antifungal agents. These interventions not only help target and reduce the fungal burden within the urinary tract but also enhance overall patient outcomes by reducing the risk of systemic spread. As the landscape of fungal infections continues to evolve, incorporating these advanced irrigation techniques into clinical practice

could provide a vital tool in combating resistant infections, thereby improving management protocols for patients facing similar complications.

### CRedit authorship contribution statement

**Avin Mabadi:** Writing – original draft, Validation, Conceptualization. **Effat Davoudi-Monfared:** Writing – review & editing, Investigation, Data curation. **Arash Jafarieh:** Writing – review & editing, Supervision. **Pershang Nazemi:** Writing – original draft, Resources, Investigation, Conceptualization.

### Consent

An informed written consent was provided by the patient regarding publication of her illness course without noting her identity.

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### Competing interest

All authors state that they have no conflict of interest.

### References

- Desai R, Batura D. A systematic review and meta-analysis of risk factors and treatment choices in emphysematous pyelonephritis. *Int Urol Nephrol.* 2022;54:717–736. <https://doi.org/10.1007/s11255-022-03131-6>.
- Wu SY, Yang SS, Chang SJ, Hsu CK. Emphysematous pyelonephritis: classification, management, and prognosis. *Tzu Chi Med J.* 2022;34(3):297–302. <https://doi.org/10.4103/tcmj.tcmj.257.21>. Published 2022 Apr 13.
- Ngo XT, Nguyen TT, Dobbs RW, et al. Prevalence and risk factors of mortality in emphysematous pyelonephritis patients: a meta-analysis. *World J Surg.* 2022;46(10):2377–2388. <https://doi.org/10.1007/s00268-022-06647-1>.
- Lieb MW, Dennison JJ, Mubarik A. Fungal pyelonephritis and fungemia due to obstructive uropathy. *WMJ.* 2022;121(2):E27–E30.
- Cases-Corona C, Shabaka A, Gonzalez-Lopez A, et al. Fulminant emphysematous pyelonephritis by Candida glabrata in a kidney allograft. *Nephron.* 2020;144(6):304–309. <https://doi.org/10.1159/000507259>.
- Kamaliah MD, Bhajan MA, Dzarr GA. Emphysematous pyelonephritis caused by Candida infection. *Southeast Asian J Trop Med Publ Health.* 2005;36(3):725–727.
- Mohamed AH, Mohamud HA. Emphysematous pyelonephritis caused by candida species: a case report and outcome of 1 year follow-up. *Urol Case Rep.* 2020;30:101113. <https://doi.org/10.1016/j.eucr.2020.101113>. Published 2020 Jan 11.
- Suárez Fernández ML, Ridao Cano N, Álvarez Santamarta L, Gago Fraile M, Blake O, Díaz Corte C. A current review of the etiology, clinical features, and diagnosis of urinary tract infection in renal transplant patients. *Diagnostics.* 2021;11(8):1456. <https://doi.org/10.3390/diagnostics11081456>. Published 2021 Aug 12.
- Zembower TR. Epidemiology of infections in cancer patients. In: Stosor V, Zembower T, eds. *Infectious Complications in Cancer Patients*. Cham: Springer; 2014. Cancer Treatment and Research; vol. 161.
- Pristov KE, Ghannoum MA. Resistance of Candida to azoles and echinocandins worldwide. *Clin Microbiol Infect.* 2019;25(7):792–798. <https://doi.org/10.1016/j.cmi.2019.03.028>.
- Drew RH, Perfect JR. Conventional antifungals for invasive infections delivered by unconventional methods; aerosols, irrigants, directed injections and impregnated cement. *J Fungi (Basel).* 2022;8(2):212. <https://doi.org/10.3390/jof8020212>. Published 2022 Feb 21.
- Hodgson R, Kennedy BK, Masliah E, et al. Aging: therapeutics for a healthy future. *Neurosci Biobehav Rev.* 2020;108:453–458. <https://doi.org/10.1016/j.neubiorev.2019.11.021>.