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An Alternative Urinary Tract Irrigation Method in Children with Fungal Urinary Tract Infections

Fungal İdrar Yolu Enfeksiyonu Olan Çocuklarda Alternatif Bir Üriner Sistem İrrigasyon Metodu

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Abstract

Nowadays, fungal urinary tract infections (UTI) are encountered more often at all ages. However, the difficulty in distinguishing between colonization and infection complicates diagnosis and treatment. Besides, there are also questions about which patients should be treated using which agent and for how long. In some cases, local irrigation may be preferred, apart from systemic treatment. Two pediatric patients, who both have a nephrostomy tube (NT) inserted due to severe hydronephrosis with urinary system obstruction, were found to have a UTI at the time of admission, one with fever and the other without fever, and candida species were isolated in urine cultures. Since candiduria persists despite systemic treatment, amphotericin B irrigation was planned. The NT was connected to a drainage bag and serum infusion set with a three-way stopcock. Amphotericin B (50 mg/L in saline) was sent into the renal pelvis and left there for an hour, then drained out. The procedure was performed continuously 24-hours a day for five days. By this way, we didn't need to insert a second NT and gave enough time for the anti-fungal agent to reach the bladder. In children with persistent fungal UTI, local anti-fungal therapy may be preferred to prevent fungus ball development. Usage of only one NT for anti-fungal irrigation of urinary tractus may be useful in these cases.

Keywords: Candiduria, nephrostomy, local irrigation

Öz

Günümüzde fungal idrar yolu enfeksiyonlarına (İYE) her yaş grubunda daha sık oranlarda rastlanmaktadır. Ancak kolonizasyon ile enfeksiyonu ayırt etmedeki zorluk, tanı ve tedaviyi zorlaştırmaktadır. Ayrıca hangi hastanın, ne kadar süreyle ve hangi ajanla tedavi edileceğine dair sorular bulunmaktadır. Bazı olgularda sistemik tedavinin yanı sıra lokal irrigasyon da tercih edilebilir. Ciddi hidronefroz ve üriner sistem obstrüksiyonu nedeniyle nefrostomi kateteri (NK) takılmış olan iki çocuk hastanın başvuruları sırasında, birinde ateşli diğerinde ateşsiz İYE saptandı ve idrar kültürlerinde kandidüri üretildi. Sistemik tedaviye rağmen devam eden dirençli kandüriden dolayı NK aracılığıyla amfoterisin B irrigasyonu planlandı. NK, drenaj torbası ve serum infüzyon seti üç yollu musluk ile



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Öz

bağlandı. Amfoterisin B (salin içinde 50 mg/L) renal pelvise gönderildi ve 60 dakika bekletildikten sonra boşaltıldı. Bu prosedür 24 saat/5 gün sürekli olarak gerçekleştirildi. Bu teknikle ikinci bir NK'ye ihtiyaç duyulmadı ve anti-fungal ajanın mesaneye ulaşması için yeterli zaman verilmiş oldu. Dirençli fungal idrar yolları enfeksiyonlarında mantar topu gelişimini önlemek için lokal anti-fungal tedaviler tercih edilebilir. Bu durumlarda, sadece bir NK kullanılarak üriner sistemin anti-fungal irrigasyonu yararlı olabilir.

Anahtar Kelimeler: Kandidüri, nefrostomi, lokal irrigasyon

Introduction

Urinary tract infections (UTI) can occur with a wide spectrum of fungi, However, most infections are with *Candida* spp. and mainly appear as complicated nosocomial infections. It is typically diagnosed with pyuria and urine culture showing high colony count *Candida* growth⁽¹⁾. There are also some uncertainties about which patients should be treated using which agent and for how long. This article presents two candiduria patients treated with irrigation of nephrostomy tube (NT).

Case 1

Ten months old Syrian boy presented with cloudy urine draining through the left NT. He had no fever or any other complaining.

His past medical history revealed that he had been followed up with antenatal hydronephrosis and had diagnosed ureterovesical junction obstruction on the left kidney (Figure 1). He had presented with acute pyelonephritis, and NT placement was performed two months ago due to pyonephrosis. Left NT was placed two months ago due to pyonephrosis.

In this admission, his general condition was good, and his physical examination was irrelevant. He internalized and IV meropenem was started due to isolation of both *Escherichia coli* (with an extended spectrum of beta-lactamase) and *Klebsiella pneumoniae* in the urine. On the fourth day, *Candida tropicalis* was also isolated on control urine culture. Despite the addition of IV fluconazole, fungal growth persists in repeated urine cultures.

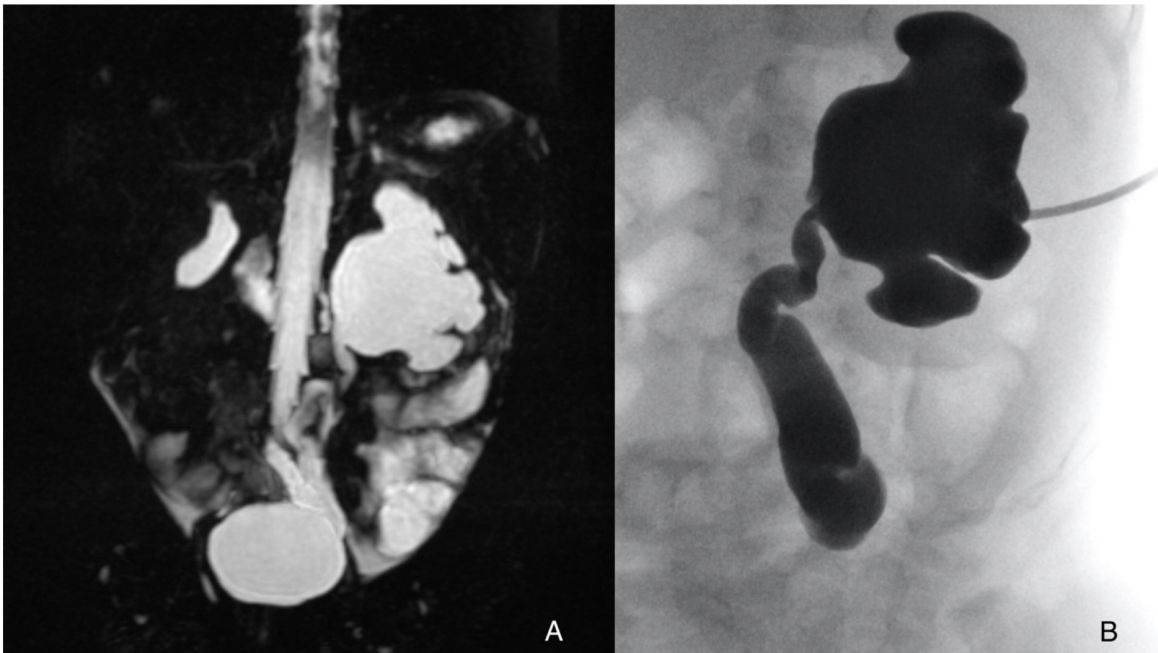


Figure 1. Radiologic images of Case 1 showing left ureterovesical junction obstruction; (A) with MR urography; (B) with digital nephrostomogram image which is obtained by radiocontrast injection through nephrostomy tube

MR: Magnetic resonance

Case 2

A 10 year old girl with meningomyelocele and neurogenic bladder was admitted with resistant fever. She had been diagnosed bilateral hydronephrosis, vesicoureteral reflux with recurrent UTI, chronic kidney disease with bilateral renal scars. Bilateral ureteroneocystostomy surgery was performed just a week ago. Her physical examination shows no clue to detect the source of fever. However, *Candida albicans* (*C. albicans*) are isolated in urine culture. Fever persists despite IV anti-fungals and antibiotics with broad-spectrum (fluconazole, amphotericin, vancomycin, meropenem, metronidazole, ciprofloxacin, amikacin, linezolid). Free fluid localized at bilateral perirenal region and deterioration of hydroureteronephrosis were reported on ultrasonography (USG). The perirenal fluid was aspirated USG-guided and NTs were inserted into both the kidneys. Urine samples obtained directly from NTs showed *C. albicans* again.

Clinical Course of Both Cases

The clinic and laboratory results of these two cases are summarized in Table 1. In both cases, irrigation of NTs with amphotericin B was planned while continuing systemic therapy. Amphotericin B was prepared at a concentration of 50 mg in 1000 mL saline. The NT is connected to a drainage bag and serum infusion set with a three-way stopcock (Figure 2). While urinary catheter was keeping closed, the solution with amphotericin B (30 cc to Case 1, 50 cc to Case 2) was sent into the renal pelvis through the stopcock in 5-minutes, then stopcock was turned off for both renal pelvis and drainage bag. After waiting for 60-minutes, renal pelvis was drained. This procedure was performed continuously 24-hours a day for five days. Urine culture sterilization and fever control were achieved in cases.

Discussion

Fungal UTI are gradually increasing in hospitalized children, especially in those with indwelling drainage devices⁽¹⁾. Immunosuppression, usage of broad-spectrum antibiotics, invasive devices, urinary system anomalies, diabetes mellitus are defined as the main risk factors for children⁽¹⁾. These two cases had multiple risk factors for fungal UTI.

Once candiduria is detected in a person, it is difficult to distinguish whether it is colonization or infection, but this distinction is essential for the decision to treat⁽²⁾. Urinary findings, like the presence of yeast cells or pyuria, cannot distinguish fungal colonization from infection. The

presence of fungal casts in the urine cytology sample with periodic acid-Schiff or silver staining may indicate kidney involvement⁽²⁾.

It is emphasized that the cases should be examined in 5 main groups: 1. *Asymptomatic candiduria* (previously healthy) 2. *Asymptomatic candiduria* (outpatient with predisposing factor) 3. *Asymptomatic candiduria* (inpatient with predisposing factor) 4. *Symptomatic candiduria* (cystitis, pyelonephritis, epididymal-orchitis or urinary system fungus ball) 5. *Candiduria* in a clinically unstable patient⁽³⁾. Asymptomatic candiduria may need to be treated in neutropenic cases, low birth weight infants (<1500 g), or before manipulation of urinary tract. For these circumstances, oral fluconazole (6 mg/kg) or IV amphotericin B can be given 0.3-0.6 mg/kg. Antifungal treatment should be given for at least 7 days in localized bladder or kidney infections⁽⁴⁾.

The first case presented in this report, could be classified as asymptomatic candiduria due to low acute-phase reactants and the absence of fever. However, systemic antifungal treatment had given because of the risk factors for fungus ball development. The second case was symptomatic candiduria with localized kidney infection. So systemic antifungal treatment was indicated in the case.

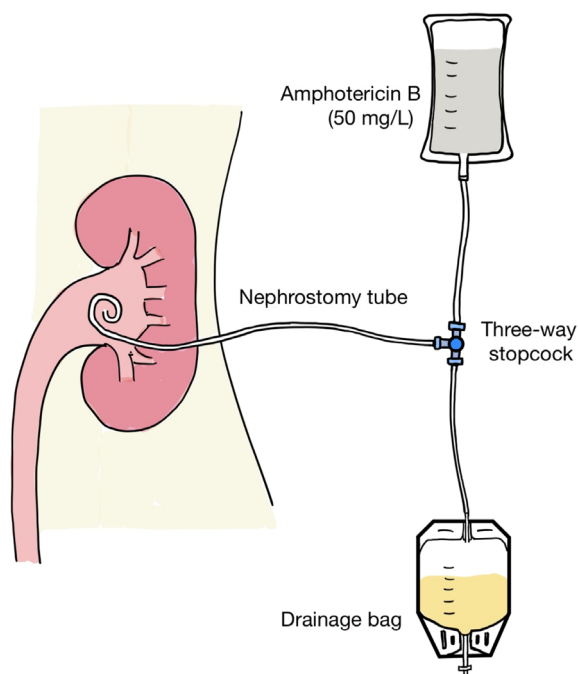


Figure 2. Illustration of the connection of the nephrostomy tube, drainage bag and serum infusion set with amphotericin B by a three-way stopcock

Table 1. Clinical and demographic features of both cases

	Case 1	Case 2
Age	8 months	10 years
Gender	M	F
Primary diagnosis	Ureterovesical junction obstruction	Myelomeningocele, neurogenic bladder, bilateral grade-5 vesicoureteral reflux
Fever	(-)	(+)
Urine culture	<i>C. albicans</i> 10 ⁵ CFU/mL	<i>C. albicans</i> 10 ⁵ CFU/mL
Laboratory	Normal	High acute phase reactants
USG	Right; normal, left; pelvis AP diameter 30 mm	Right; grade-3 pelvicaliectasis, perirenal fluid collection, left; grade-2 pelvicaliectasis dilated ureter
Nephrostomy	(+), Left kidney	(+), Bilateral
Treatment for fungal infection	Systemic fluconazole, systemic amphotericin B. Then nephrostomic irrigation with amphotericin B	Systemic fluconazole, systemic amphotericin B, then nephrostomic irrigation with amphotericin B
Improvement	(+)	(+)

AP: Anteroposterior, CFU: Colony-forming unit, USG: Ultrasonography, *C. albicans*: *Candida albicans*, M: Male, F: Female

Urinary tract imaging should be performed repeatedly, especially in patients with diabetes and urinary tract malformation who are at risk of developing fungus ball⁽⁴⁾. The primary treatment of fungus ball is surgical removal. Alternatively, the insertion of NT to maintain adequate drainage and irrigation of NT with anti-fungal agent is recommended in addition to systemic treatment. By this way, NTs act as a mediator to deliver locally anti-fungal agent, so the drug can be effective when the therapeutic dose is not reached in the urine⁽³⁾. Local irrigation had been performed in both the cases in this report. Because they both had NTs which were inserted to handle urinary tract obstructions and persistent fungal growth on urine cultures despite systemic treatment.

Irrigation treatments have been discussed in many studies. But it is controversial which anti-fungal agent will be applied at which dose for how long. In both the cases, amphotericin B with 50 mg/L concentration was chosen and received effective responses. In a meta-analysis, the candiduria clearance after more than 7 days of continuous bladder irrigation has showed superior response compare to intermittent irrigation in 377 adult patients⁽⁵⁾. We performed continuous irrigation for 24-hours per 5-days.

In adult patients, two NTs may need to be inserted to ensure the urinary tractus was not obstructed⁽⁶⁾. But it may not be suitable in children. We performed a different procedure which have not mentioned in the literature before. We connected infusion set of antifungal solution, NT and a drainage bag to each other with a three-way stopcock. While

keeping drainage bag and urinary bladder catheter closed, we filled the renal pelvis with antifungal solution through NT. After 60 min, we changed the direction of three-way stopcock to open line to drainage bag (Figure 2). With this way, we did not need to insert a second NT, and we gave enough time for an anti-fungal agent to pass through the obstruction and reach the bladder. With this procedure, we had received effective clinical responses in both the cases.

Conclusion

In conclusion, fungal UTIs remains an important problem in patients with multiple predisposing factors. Anti-fungal irrigation treatment should be started quickly by using mediator ways in cases with resistant fungal growth in urine cultures before the fungus ball develops.

Ethics

Informed Consent: Informed consent form was filled out by each case.

Peer-review: Externally peer-reviewed.

Author Contributions

Surgical and Medical Practices: D.A., G.E., L.D., Concept: C.B., S.A.Ç., Data Collection or Processing: F.M., B.K.D., D.A., Literature Search: G.E., E.S., L.D., Ö.Ö.Ş., Writing: G.E., E.S., D.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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References

1. Lundstrom T, Sobel J. Nosocomial candiduria: a review. *Clin Infect Dis* 2001;32:1602-7.
2. Argyle C, Schumann GB, Genack L, Gregory M. Identification of fungal casts in a patient with renal candidiasis. *Hum Pathol* 1984;15:480-1.
3. Alfouzan WA, Dhar R. Candiduria: Evidence-based approach to management, are we there yet? *J Mycol Med* 2017;27:293-302.
4. Pappas PG, Kauffman CA, Andes DR, et al. Clinical Practice Guideline for the Management of Candidiasis: 2016 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 2016;62:e1-50.
5. Tuon FF, Amato VS, Penteado Filho SR. Bladder irrigation with amphotericin B and fungal urinary tract infection--systematic review with meta-analysis. *Int J Infect Dis* 2009;13:701-6.
6. Tan WP, Turba UC, Deane LA. Renal fungus ball: a challenging clinical problem. *Urologia* 2017;84:113-5.