Central European Journal of Urology

ORIGINAL PAPER

URINARY TRACT INFECTIONS

# Beyond *Candida*: A clinical insight into rare fungal pyelonephritis in urological practice

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Citation: Pandya P, Valsangkar R, Bhave S, Kashyapi B. Beyond *Candida*: A clinical insight into rare fungal pyelonephritis in urological practice. Cent European J Urol. 2026; 79: 67-71.

Article history
Submitted: Oct. 14, 2025
Accepted: Dec. 5, 2025
Published online: Jan. 11, 2026

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**Introduction** Non-*Candida* fungal infections of the urinary tract, such as *Aspergillus* and *Mucor*, though uncommon, pose significant diagnostic and therapeutic challenges. Their variable presentation, antifungal resistance, and frequent association with immunocompromised states or prior instrumentation necessitate a high index of suspicion. This study aims to describe the clinical profile, diagnostic approach, and management outcomes of non-*Candida* fungal pyelonephritis in urological practice.

**Material and methods** A retrospective observational analysis was conducted on four patients diagnosed with non-*Candida* fungal pyelonephritis at a tertiary urology centre between April 2024 and April 2025. Patients with urine cultures positive for fungi other than *Candida* were included. Data on clinical features, comorbidities, imaging findings, microbiology, intraoperative observations, treatment modalities, and outcomes were reviewed. Diagnosis was confirmed through culture and/or histopathology, and management was coordinated with infectious disease specialists.

**Results** Four patients (three males, one female; age 37–72 years) were identified – three with *Aspergillus* and one with *Mucor* infection. Diabetes mellitus was the predominant comorbidity (3/4), and two patients had a history of prior urological instrumentation. Presentations ranged from incidental findings to pyelonephritis with fever and flank pain. Individualized management included minimally invasive percutaneous nephrolithotomy, pyeloplasty, percutaneous nephrostomy insertion, or nephrectomy. All patients responded to therapy, with infection clearance and preserved or improved renal function on follow-up. No mortality was observed.

**Conclusions** Non-*Candida* fungal pyelonephritis, though rare, requires early diagnosis and individualized surgical and antifungal management. Multidisciplinary collaboration ensures favourable outcomes and renal preservation.

Key Words: fungal pyelonephritis ‹› *Aspergillus* ‹› *Mucor* ‹› non-*Candida* infection ‹› urology ‹› antifungal therapy

## INTRODUCTION

Non-*Candida* fungal infections (*Aspergillus*, *Mucor*, *Cryptococcus*, etc.), though uncommon, pose significant diagnostic and therapeutic challenges due to their atypical presentation, resistance patterns, and association with immunocompromised states or indwelling devices. Managing non-*Candida* fungal pyelonephritis can be challenging for urologists. We aim to enhance awareness regarding the clinical presentation, diagnostic approaches, and treatment strategies for non-*Candida* fungal pyelonephritis. By highlighting key risk factors, imaging findings, and evidence-based therapeutic interventions, we seek to facilitate early diagnosis and effective management, ultimately improving patient outcomes.

## MATERIAL AND METHODS

A retrospective analysis was conducted of four patients diagnosed with non-*Candida* fungal pyelonephritis at a tertiary urology centre between

April 2024 and April 2025. All patients whose urine culture was suggestive of a fungus other than *Candida*. Clinical records were collected for comorbidities, presenting symptoms, imaging findings, microbiological profiles, intraoperative findings, surgical interventions, and outcomes. Diagnosis was confirmed based on microbiological culture and/or histopathological examination. All patients were managed in coordination with infectious disease specialists, and follow-up data were assessed for clinical resolution and renal preservation.

### Case 1

The patient was accidentally diagnosed with a low-density kidney stone on computed tomography
↓
Mini-perc fungal elements: percutaneous nephrostomy (PCN) + culture
↓
Aspergillosis: Broth microdilution – treated with voriconazole

### Case 2

Patient presented with pyelonephritis and pelvi-ureteric junction obstruction (PUJO)
↓
Renal pelvis culture: *Aspergillus*
↓
Treated with antifungal
↓
Pyeloplasty

### Case 3

Patient presented with fever and renal calculi
↓
PCN
↓
Culture s/o *Aspergillus*
↓
Antifungal
↓
Percutaneous nephrolithotomy (PCNL)

### Case 4

Patient referred from outside with unresolved pyelonephritis despite stenting
↓
PCN insertion
↓
Blood culture and sensitivity (CS) test, and renal urine CS s/o *Rhizopus*
↓
Amphotericin via PCN and intravenous
↓
Unresolving sepsis
↓
Nephrectomy under the cover of liposomal amphotericin B

### Bioethical standards

Study was conducted in accordance with the Declaration of Helsinki. This study was approved by the Deenanath Mangeshkar Hospital Scientific and Ethics Comittee.
The participant provided written consent.

## RESULTS

Four cases of non-*Candida* fungal pyelonephritis were retrospectively analyzed. The patients included three males and one female, aged between 37 and 72 years. Three patients had *Aspergillus*, and one had *Mucor*. Diabetes mellitus was the most common comorbidity (3/4 cases), with one patient also on chronic steroid therapy. Two patients had a history of prior urological instrumentation (PCNL and URSL).
Clinical presentation varied, including incidental diagnosis, pyelonephritis, and fever with flank. Management strategies were individualized: one patient underwent mini-perc, another pyeloplasty, one required PCN insertion, and one underwent nephrectomy (Table 1, Figures 1–4).
Outcomes were favourable in all cases with no reported mortality. Follow-up showed improved renal function, resolution of hydronephrosis, infection clearance, and negative cultures. These cases underscore the variable presentation and need for tailored management.

## DISCUSSION

**Differential diagnoses:** Invasive non-*Candida* fungal pyelonephritis can mimic renal tuberculosis and xanthogranulomatous pyelonephritis (XGPN) on imaging, both showing low-density calcific material and chronic inflammatory changes. Hence, these entities should be included in the differential diagnosis for very low-density renal calculi or renal pelvic masses [1].
**Predominance of renal aspergillosis:** Within genitourinary fungal infections, renal aspergillosis constitutes nearly 80–81% of cases [1].

**Clinical presentation:** The most frequent symptoms are flank pain (≈36%) and fever (≈33%), though patients may also present with obstructive uropathy, sepsis, or non-functioning kidney [1].

**Risk factors:** Diabetes mellitus remains the most prevalent risk factor, followed by HIV infection and other causes of immunosuppression [2, 3].

**Microbiological findings:** Routine per-urethral urine cultures are often negative; fungal growth

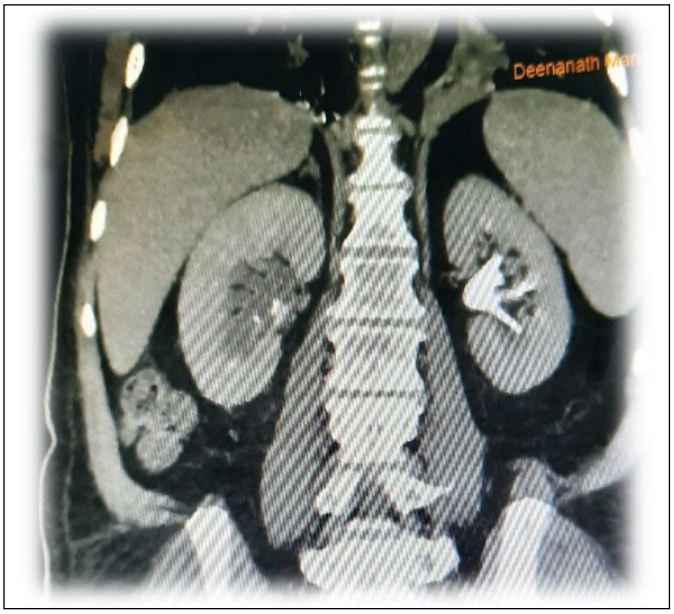

**Figure 1.** *Case 1: Fungal matter in the right renal pelvis was misinterpreted as a low-density calculus. It may also mimic renal tuberculosis or xanthogranulomatous pyelonephritis on imaging and clinical presentation. In this case, it was planned for mini-perc.*

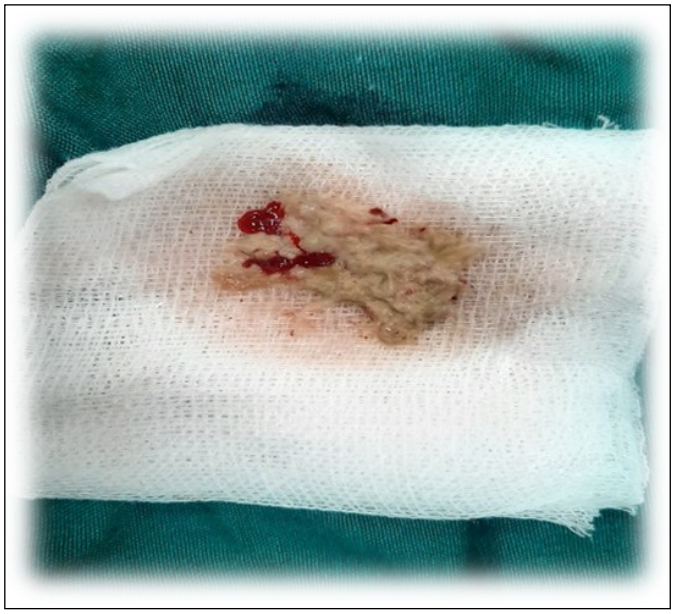

**Figure 2.** *Case 1: Intra-operative image – on inserting the scope during mini-perc, a fungal element was found instead of a stone.*

**Table 1.** *Presentation and management of all cases*

| Variable | Case1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| Age (years) | 56 | 37 | 72 | 41 |
| Sex | M | F | M | M |
| Comorbidities | DM, steroids | None | DM | DM |
| Previous instrumentation | – | h/o PCNL | h/o URSL | – |
| Presentation | Accidental (15 mm PUJ calculus 150 HU with HN) (Figures 1, 2) | Fever and flank pain, PUJO | Renal calculi (post-URSL fever) | Pyelonephritis |
| Management | Mini PERC | Pyeloplasty | PCN insertion | Nephrectomy |
| Follow up | Renal function Improved | Resolution of HDN | Stone free, culture-ve | Infection free |
| Mortality | – | – | – | – |
| Antifungal | Inj. voriconazole followed by tab. voriconazole 200 mg twice a day | Inj. voriconazole followed by tab. voriconazole 200 mg twice a day | Inj. voriconazole followed by tab. voriconazole 200 mg twice a day | Amphotericin B i.v. and via PCN |
| Duration (weeks) | 6 | 6 | 6 | 4 i.v. |
| Monitoring | Serum electrolytes and voriconazole levels every 72 hours. Urine fungal culture with BMD after 6 weeks | Serum electrolytes and voriconazole levels every 72 hours. Urine fungal culture with BMD after 6 weeks | Serum electrolytes and voriconazole levels every 72 hours. Urine fungal culture with BMD after 6 weeks | RFT, LFT, Haemogram every 48 hours. Urien and blood fungal culture after 4 weeks |

BMD – broth micro-dilution; DM – diabetes mellitus; HN – hydronephrosis; LFT – Liver Function Test; PCN – percutaneous nephrostomy; PCNL – percutaneous nephrolithotomy; PUJO – pelvi-ureteric junction obstruction; RFT – Renal Function Test; URSL – ureteroscopic lithotripsy

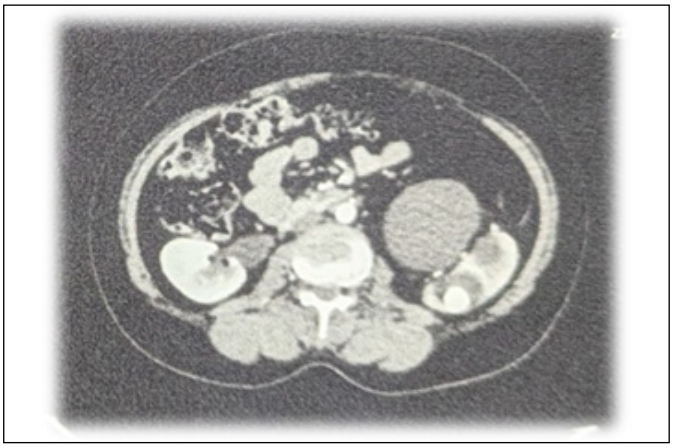

**Figure 3.** *Case 2: Patient had a recent history of Left PCNL and presented to us with symptoms of pyelonephritis. On imaging, left PUJ obstruction was seen, and renal urine culture was suggestive of Aspergillus. The patient was treated adequately with anti-fungal followed by pyeloplasty.*

is more frequently obtained from renal pelvic urine or tissue cultures, highlighting the importance of targeted sampling [1].

**Pharmacologic considerations:** As posaconazole is poorly excreted unchanged in urine, voriconazole or liposomal amphotericin B (recommended dose 5 mg/kg/day for patients with normal renal function) are preferred systemic antifungals [1]. Therapeutic drug monitoring and assessment of hepatic/renal function are advised during therapy. Monitor serum voriconazole levels every 72 hours to prevent its toxicity.

**Mucormycosis:** Renal *Mucormycosis* is a rapidly progressive, angio-invasive infection with reported mortality between 44% and 85% [4]. Over 50% of cases require nephrectomy or percutaneous drainage due to poor response to antifungal therapy alone [5, 6].

**Mortality:** 28%.

**Decision-making: surgery vs medical therapy:** Management should be individualized according to:

- **Extent and location of disease** – localized fungal balls or superficial lesions may respond to antifungals ±endoscopic removal.
- **Renal function** – non-functioning kidneys with necrosis or sepsis typically mandate nephrectomy.
- **Clinical response** – persistent fever or sepsis despite optimal antifungal therapy necessitates surgical intervention.
- **Source control** – percutaneous or endoscopic drainage improves outcome in obstructed or suppurative disease [1].

**Summary:** Early suspicion, directed renal pelvic sampling, prompt initiation of appropriate antifungal therapy, and timely source control through drainage or surgery are critical to improving survival in non-*Candida* fungal pyelonephritis [1].

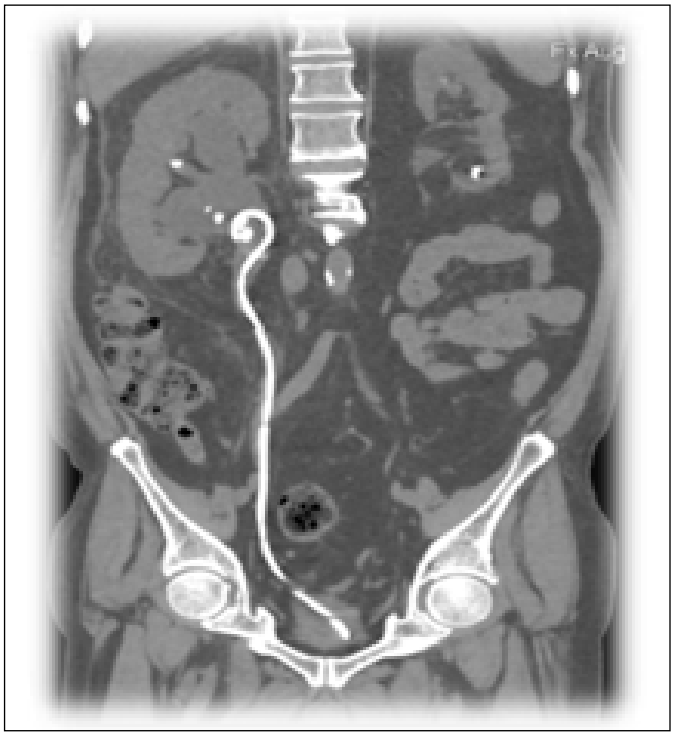

**Figure 4.** *Case 3: Patient presented with fever and a right renal stone, post-recent history of URSL. PCN was inserted as thick fungal exudates were not expected to drain through the DJ stent.*

## CONCLUSIONS

Non-*Candida* fungal pyelonephritis is a rare but clinically significant entity that requires high suspicion, especially in immunocompromised or post-instrumentation patients. It presents variably and may mimic other urological conditions, necessitating individualized approaches. Early identification and appropriate surgical intervention, in conjunction with antifungal therapy, can lead to favorable outcomes and renal preservation. Multidisciplinary collaboration is key to managing this challenging infection effectively.

### CONFLICT OF INTERESTS

The authors declare no conflict of interest.

### FUNDING

This research received no external funding.

### ETHICS APPROVAL STATEMENT

The study was approved by the Deenanath Mangeshkar Hospital Scientific and Ethics Comittee.

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