Isolated Renal Mucormycosis in an Immunocompetent Child: A Rare Case Report

Sara S Dhanawade1, Gouri C Rajput2

ABSTRACT
Isolated renal mucormycosis (IRM) is a life-threatening and extremely rare entity in immunocompetent children. Unfortunately, the diagnosis of mucormycosis using clinical and laboratory parameters can be difficult leading to high mortality. We report a case of IRM in a 3-year-old immunocompetent child who was successfully managed with amphotericin B and nephrectomy. A high index of suspicion, early diagnosis, and aggressive treatment with antifungal and surgery is critical for a favorable outcome.

Keywords: Amphotericin B, Immunocompetent, Nephrectomy, Renal mucormycosis.

INTRODUCTION
Mucormycosis is a fatal, angioinvasive fungal infection commonly seen in immunocompromised patients. Isolated renal mucormycosis (IRM) is very rare and carries high mortality without prompt and aggressive management. It is even rarer in immunocompetent children. Here, we report a case of IRM in an immunocompetent child who was successfully managed with antifungal therapy and nephrectomy.

CASE DESCRIPTION
A 3-year-old male child second issue of nonconsanguineous marriage presented with a history of fever on and off for 3 months, abdominal pain for 3 months, and vomiting for 15 days. Fever was intermittent in nature, moderate to high grade, relieved by antipyretics. There was a history suggestive of pain in the right flank. There was no history of red-colored urine, dysuria, or decreased urine output. He had received multiple antibiotics for the above complaints. Past history revealed one episode of dysuria with fever suggestive of urinary tract infection (UTI) 6 months before presentation. Birth and family history were non-significant. He was immunized as per the national schedule.

On examination, he was sick looking and febrile (temp. 101°F), the pulse rate: 158 minutes regular, respiratory rate: 46 minutes, and blood pressure (BP) 130/92 (>99th centile). There was pallor, but no icterus or lymphadenopathy. He was averagely nourished and weighed 13.5 kg. Systemic examination revealed the fullness of the flank on the right with renal angle tenderness. The right kidney was palpable. The liver was palpable 2 cm and the spleen was just palpable. There was free fluid in the abdomen. The rest of the systemic examination was normal.

Our provisional diagnosis was pyelonephritis, to rule out pyonephrosis. The investigations revealed anemia (Hb: 8 gm/dL), mild leukocytosis (WBC: 13,400 cells/mm³; P: 71%, L: 24%), and platelets 250,000. The peripheral smear showed hypochromic microcytic anemia and the presence of toxic changes in WBCs. Other investigations included erythrocyte sedimentation rate (ESR): 65 mm/hour, blood urea: 78 mg/dL, serum creatinine: 0.9 mg/dL, lactate dehydrogenase (LDH): 625 U/L, and HIV negative. Urinalysis showed 15–20 pus cells. He was started on injection cefotaxime after sending urine and blood cultures. However, in view of high fever and toxicity antibiotic was stepped up to meropenem after 48 hours.

The abdominal ultrasonography revealed a large solid hypechoic mass of 6 × 7 cm in the upper pole of the right kidney with few internal cystic areas (Fig. 1) and splenomegaly. The computerized tomography (CT) scan abdomen plain with contrast showed enhancement of the right kidney with mass limited to renal capsule involving upper pole. There was evidence of cortical necrosis and enhancement of the right renal hilum (Fig. 2). The urine culture grew Enterococcus faecium sensitive to vancomycin and the same was added. The blood culture was sterile.

Ultrasonography guided aspiration of the renal mass yielded thick pus. The microscopy showed numerous pus cells, viable and degenerated polymorphs, and occasional lymphocytes against the background of necrotic debris. No malignant cells were seen. Pus culture was sterile. The renal biopsy revealed ischemic necrosis and vasculitis. Few non-septate fungal hyphae were branching at right angles and occasional ill-formed granulomas with multinucleated giant cells which clinched the diagnosis of renal mucormycosis. The child was started on amphotericin B. However, fever persisted. Considering the extensively damaged right kidney and the angioinvasive nature of infection decision to perform nephrectomy was made after a multidisciplinary meeting.

The gross anatomy of the kidney showed an enlarged size (9.5 × 6 × 4 cm, normal for the age being 7.36 × 5 × 2 cm) in the cut section showed (a) loss of corticomedullary differentiation, (b)
thinned out cortex, (c) medulla replaced by grayish-white soft ill circumscribed necrotic tissue $8.5 \times 5 \times 3$ cm as shown in Figures 3 and 4. The microscopy revealed focal areas of necrosis and ill-defined granulomas (Fig. 5).

Amphotericin was continued for 4 weeks. He responded well to treatment and had normal BP and renal function at discharge. The child is on regular follow-up, has been asymptomatic, and growing well.

**Discussion**

Mucormycosis is a potentially fatal opportunistic infection caused by fungi of the order Mucorales, genera *Rhizopus*, *Mucor*, and *Absidia*. In recent years, there has been a rise in its incidence, especially in the Asian continent. In Asia, diabetes mellitus overshadows all other risk factors. Other predisposing factors include defereroxamine therapy, burns, trauma, malnutrition, and IV drug abuse. It can cause localized or disseminated disease. Bilateral disease carries grave prognosis. The penetration through the endothelial lining of blood vessels leads to hematogenous dissemination.

In a review of pediatric mucormycosis, Rolides et al. described rhinocerebral (18%), pulmonary (16%), gastrointestinal (21%), and cutaneous in 27%. Rhinocerebral is commonly associated with diabetes mellitus whereas pulmonary in transplant recipients and hematological malignancies. In an immunocompetent child, cutaneous mucormycosis may follow penetrating wounds to the skin.

However, our case did not have any such recognizable risk factor. There are very few cases of IRM reported in children. Jianhong et al. reported three immunocompetent children with IRM who recovered with surgery and antifungal therapy. Local infection of the kidney did not progress to disseminated disease in any of these patients and it is not clear whether infection localized to the kidney is an intrinsic characteristic of IRM. Our patient probably had bacterial pyelonephritis to begin with and superinfection with *Mucor* later on. Prior treatment with multiple antibiotics might have been a contributory factor.
Dhua et al. reported a case of IRM following pyeloplasty in an immunocompetent child. Renal mucormycosis mostly presents with fever, flank pain, pyuria, hematuria, enlarged kidney, and renal failure. Nayagam et al. reported an 18-month-old immunocompetent child with IRM who presented with repeated UTI and ultrasound findings suggestive of pyonephrosis. On exploration, the left kidney was found necrotic which was removed. The diagnosis was made on histopathology and the child recovered following antifungal therapy.

Computerized tomography typically shows enlarged kidneys with hypodense areas and is the imaging modality of choice. In our patient, CT scan corroborated the findings of ultrasound and aided in diagnosis. More recently, Saran et al. reported two cases of IRM in immunocompetent children where the diagnosis was established on postmortem renal biopsy.

Isolated mucormycosis may affect the immunocompetent host and requires a high index of suspicion. Clinical and radiological characteristics are nonspecific and diagnosis is based on the identification of fungus on histopathology of renal tissue. Early aggressive management is crucial for a favorable outcome. Nephrectomy or partial excision to remove the necrotic tissue is generally required.

**Conclusion**

Isolated renal mucormycosis is a rare fungal infection with a fatal outcome unless diagnosed promptly and managed aggressively.

**Clinical Significance**

Even in immunocompetent children with UTI symptoms, such as, flank pain, vomiting, high fever, hematuria, and enlarged kidneys, should raise the possibility of mucormycosis.

**REFERENCES**

1. Nayagam LS, Vijayanand B, Balasubramanian S. Isolated renal mucormycosis in an immunocompetent child. Indian J Nephrol 2014;24(5):321–323. DOI: 10.4103/0971-4065.133015.
2. Ibrahim AS, Spellberg B, Walsh TJ, et al. Pathogenesis of mucormycosis. Clin Infect Dis 2012;54(suppl_1):S16–S22. DOI: 10.1093/cid/cir865.
3. Prakash H, Chakrabarti A. Global epidemiology of mucormycosis. J Fungi (Basel) 2019;5(1):26. DOI: 10.3390/jof5010026Published 2019 Mar 21.
4. Jianhong L, Xianliang H, Xuewu J. Isolated renal mucormycosis in children. J Urol 2004;171(1):387–388. DOI: 10.1097/01.ju.00000100842.96636.a0.
5. Dhua AK, Sinha S, Sarin YK, et al. Isolated mucormycosis in a post-pyeloplasty kidney in an immuno-competent child. J Indian Assoc Pediatr Surg 2012;17(3):132–134. DOI: 10.4103/0971-9261.98136.
6. Gupta KL, Joshi K, Sud K, et al. Renal zygomycosis: an under-diagnosed cause of acute renal failure. Nephrol Dial Transplant 1999;14(11):2720–2725. DOI: 10.1093/ndt/14.11.2720.
7. Saran S, Naranje K, Gurjar M, et al. Isolated renal mucormycosis in immunocompetent children: a report of two cases. Indian J Crit Care Med 2017;21(7):457–459. DOI: 10.4103/jiccm.JICCM_184_17.
8. Sharma R, Shivanand G, Kumar R, et al. Isolated renal mucormycosis: an unusual cause of acute renal infarction in a boy with aplastic anaemia, Br J Radiol 2006;79(943):e19–e21. DOI: 10.1259/bjr/17821080.
9. Sobti P, Rakheja G, Mittal A. Isolated renal mucormycosis in a pediatric patient. J Case Rep 2013;3(2):390–392. DOI: 10.17659/01.2013.0090.
10. Sathe KP, Mehta KP. Irreversible fatal renal failure resulting from isolated renal mucormycosis, Saudi J Kidney Dis Transpl 2014;25(6):1312–1314. DOI: 10.4103/1319-2442.144298.
11. Munshi S, Moazin M, Abu-Daff S, et al. Renal mucormycosis in immunocompromised patient, treated with robotic nephrectomy: case report and review of articles. Urol Case Rep 2017;15:53–55. DOI: 10.1016/j.uercr.2017.08.007.
12. Petrikkoss G, Skaida A, Lortholary O, et al. Epidemiology and clinical manifestations of mucormycosis. Clin Infect Dis 2012;54(suppl_1):S23–S34. DOI: 10.1093/cid/cir866.