Emphysematous Renal Tract Disease due to
Aspergillus fumigatus

M Ahmad*, KV Dakshinamurty**

Abstract

Emphysematous renal tract disease (ERTD) is a rare necrotizing infection of renal parenchyma and/or urinary tract caused by gas producing organisms. A case of acute emphysematous renal tract disease (ERTD) (emphysematous pyelonephritis along with emphysematous cystitis) caused by Aspergillus fumigatus in a non-diabetic patient, who did not apparently have any risk factor for fungal infection, is presented. Patient had refused for any surgical intervention. He was treated successfully with liposomal amphotericin B and 5-flucytosin and achieved complete recovery. Various causes of ERTD and available therapeutic options are discussed. ©

INTRODUCTION

Emphysematous renal tract disease (ERTD) is a rare necrotizing infection of renal parenchyma and urinary tract caused by gas producing organisms. It is characterized by presence of gas in renal parenchyma, collecting system, perinephric tissue and urinary bladder. ERTD deserve special attention because of its life threatening potential, primarily due to sepsis and multisystem organ failure.

E. coli is the commonest organism found in about 75% of patients, other organisms like Proteus, Pseudomonas, Klebsiella, Acinetobacter and Clostridium are also reported. Emphysematous pyelonephritis (EPN) caused by various fungi like Candida albicans, Candida tropicalis and Cryptococcus are also well documented.1

ERTD arising from polycystic kidney disease and renal allograft are also reported. Aggressive surgical management either nephrectomy or nephroprostomy is the treatment of choice for EPN, but successful medical management alone has been reported infrequently.2

Our search for published literature did not reveal any report of ERTD caused by Aspergillus fumigatus. We report an unusual case of ERTD caused by Aspergillus fumigatus, which was managed successfully with antifungal therapy alone without any surgical intervention.

CASE REPORT

A 36 years, male, not a known diabetic presented with fever, dysuria, vomiting, decreased amount of urine and left flank pain of four days duration. There was no history suggestive of obstructive lower urinary tract symptoms, diabetes, hypertension, immunosuppressive drug intake, cough, expectoration, hematuria, graveluria, pneumaturia, instrumentation in urinary tract and discharge per urethra.

Clinical examination revealed ill-looking, pyrexic (100°F) and toxic adult. His pulse rate was 90/minute. Blood pressure 118/76 mm of Hg and respiratory rate was 22/minute. He had mild pallor and pedal edema. Abdominal examination revealed soft abdomen and tenderness over left flank. There was no mass or crepitus present. Abdominal and neurological examination was unremarkable. Fundus examination was within normal limits.

His hemoglobin, total and differential leukocyte count and platelet count was within normal limits. He had mild renal failure (serum creatinine 2.0 mg/dl) and metabolic acidosis. He did not have any evidence of diabetes mellitus, hepatic dysfunction or electrolyte imbalance.

His urine examination revealed + proteinuria, 8-10 RBCs and 20-30 WBCs/HPF, there was no cast or crystal present in urine. Twenty four hours proteinuria was 0.66 gm/day. His HBsAg, Anti HCV, HIV, ANA and ANCA were negative. C3 was within normal limits. X-ray abdomen did not reveal any calculus or gas in kidneys or urinary tract. Ultrasound examination showed normal right kidney with enlarged and echogenic left kidney without any evidence of urinary tract obstruction. Computerized tomography of kidneys with oral and intravenous contrast showed normal right kidney. Left kidney was enlarged and having multiple low-density areas.
with air and fluid collection without any pelvicalyceal system dilatation (Fig. 1). Urinary bladder also showed a small area of gas collection in bladder wall suggestive of emphysematous cystitis (Fig. 2). Computerized tomography picture was suggestive of emphysematous renal tract disease (emphysematous pyelonephritis along with emphysematous cystitis).

In view of EPN he had undergone percutaneous needle aspiration of the pus from left kidney, microscopy of this pus revealed uniform, hyaline, septate fungal hyphae with parallel walls having regular dichotomous branching suggestive of *Aspergillus* species (Fig. 3). Culture of the pus as well as urine on Sabourad’s dextrose agar grew rapidly growing (within four days), granular, brown - green colonies with a white apron suggestive of *Aspergillus fumigatus* (Fig. 4). No other organism was grown from pus and urine. Blood culture was sterile.

Patient was hospitalized and managed with intravenous fluids, proton pump inhibitors and gatifloxacin empirically for five days without any improvement. Once *Aspergillus* was identified from pus and urine, patient was advised for left nephrectomy, which he refused due to personal reasons. He was put on liposomal amphotericin-B (2-3 mg/Kg/day) along with 5 - flucytosin in modified doses for two months. He responded well to antifungal therapy. His urine output...
had improved in four days and his renal failure recovered in one week. He recovered completely in six weeks. After nine months of follow up he is in good health and has normal urine examination, normal serum creatinine (0.8 mg/dl) and normal size and echogenicity of kidneys on ultrasound.

**DISCUSSION**

ERTD is a radiological diagnosis, as symptoms and signs are little different from other causes of urinary tract infection. Presence of gas in urinary tract and renal parenchyma is often difficult to recognize on plain X-ray as it can be easily obscured by overlying bowel gas patterns. Plain abdominal films demonstrated renal parenchymal gas only in 33% of patients reviewed by Michaeli et al. Ultrasound of kidneys is quite useful for the diagnosis of urinary tract obstruction; however it is inaccurate for the identification of gas in renal parenchyma. Computerized tomography is the investigation of choice for diagnosis as well as for demonstrating its extent (staging of disease) and in assessing the response to therapy. According to computerized tomography scan findings, EPN can be classified into:

- **Class I:** Gas in the collecting system only.
- **Class II:** Gas in renal parenchyma without extension to extrarenal space.
- **Class III A:** Extension of gas or abscess to perinephric (area between the fibrous renal capsule and renal fascia) space
- **Class III B:** Extension of gas or abscess to pararenal (space beyond the renal fascia and/or extending to adjacent tissue such as psoas muscle) space.
- **Class IV:** bilateral EPN or solitary kidney with EPN

More than 90% of reported cases have been associated with diabetes mellitus, though it can also occur following urinary tract obstruction by calculi, neoplasm or stricture. It is hypothesized that hyperglycemia and necrotic tissue serve as growth media for micro-organism. Gas production is probably due to fermentation of glucose in the infected and necrotic tissue. In non-diabetic patients, impaired host response associated with impaired vascular supply has been implicated in the pathogenesis of ERTD. It is rare to have ERTD without diabetes or urinary tract obstruction. Our patient neither had diabetes mellitus nor urinary tract obstruction.

Huang JJ had analyzed the gas and had shown that it is constituted by hydrogen (15%), carbon dioxide (4.8%), nitrogen (60%) and oxygen (6.7%). The gas quickly diffuses through the body tissues and into the blood stream and provides an excellent marker for demonstration of the response to therapy.

Management of ERTD had traditionally been aggressive, poorly defined and surgical. Many of the earlier series recommended urgent nephrectomy, which is associated with high mortality rate. Nephrectomy in itself is a hazardous intervention in a septic, acidotic, uremic and unstable patient.

Huang JJ had demonstrated that in localized EPN (class I and II) percutaneous catheter drainage combined with antibiotic treatment could provide good outcome. In extensive EPN (class II and III) with a more benign manifestation (absence of acute renal failure, thrombocytopenia, shock etc), when saving the kidney is possible, percutaneous catheter drainage combined with antibiotics may be attempted with high success rate and may preserve the kidney, but in extensive EPN with fulminant course nephrectomy provides the best management. Emphysematous cystitis is more benign, and is treated with anti-microbial agents alone or combination of anti-microbial agents with relief of obstruction.

With the increasing availability of powerful antimicrobial therapy and better life support system, an alternative medical approach is emerging. Major benefit of this approach is preservation of renal function, initial patient stabilization and reserving surgery only for non-responder.

Yung Liang Wan et al had reported that renal failure (serum creatinine >1.4 mg/dl), thrombocytopenia (platelet count <60,000/cu mm), type I EPN and higher urinary red cell count are the predictor of an unfavorable outcome in patients with EPN.

Our patient presented with clinical feature suggestive of urinary tract infection. There was no improvement despite appropriate intravenous antibiotics for five days. It is proposed that ERTD should be suspected in patients with urinary tract infection, who fail to respond to appropriate treatment in 3-4 days. In these patients abdominal imaging preferably contrast-enhanced computerized tomography scan should be done to look for evidence of ERTD.

The successful outcome in this patient suggests a role for sole medical management in some patients with less extensive disease and benign course, who are not a candidate or refuse surgical intervention. It also indicates that medical therapy could be life-saving if it is intensive and prolong.

We report this case because of a new organism (Aspergillus fumigatus) causing ERTD in a nondiabetic healthy adult who was cured with antifungal therapy alone without any surgical intervention.

**REFERENCES**