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Inflammation and infection

Evolving case of emphysematous pyelonephritis in a second renal allograft

David Ambinder [a], Akhil Saji [a], Daniel Bassily [a], Vincent Wong [a], Devon John [b], Nathan C. Wong [a,*]

[a] Department of Urology, New York Medical College/Westchester Medical Center, Valhalla, NY, USA
[b] Division of Intra-Abdominal Transplant and Hepatobiliary Surgery, Department of Surgery, New York Medical College/Westchester Medical Center, Valhalla, NY, USA

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ABSTRACT

Emphysematous pyelonephritis is an acute necrotizing infection with gas in the kidney that portends a poor prognosis. Patients present with sepsis, requiring fluid resuscitation, glucose control, and broad-spectrum antibiotics. Surgical intervention ranges from relief of urinary obstruction (nephrostomy tube or stent), percutaneous drainage or nephrectomy. We present a 51-year-old second kidney transplant recipient diabetic male, suffering from sepsis of unknown etiology which was subsequently revealed to be due to emphysematous pyelonephritis. Percutaneous drainage was performed initially followed by renal transplant nephrectomy after no improvement of his clinical status. Herein, we describe the clinical course and escalation in management.

Introduction

Emphysematous pyelonephritis (EPN) is an uncommon acute necrotizing infection involving renal parenchyma and surrounding tissue caused by gas-forming uropathogens, the most common being *E. coli* followed by Klebsiella and Proteus species. It has rarely been described in the literature, primarily in case reports, to occur in patients with renal transplant.

The gold standard for diagnosis and classification of EPN is computed tomography (CT) imaging. Classification to guide management is based on the extent of gas involvement in renal tissue. Treatment options historically have been upfront surgical nephrectomy but there has been a recent shift for more conservative management upfront with antibiotic therapy and percutaneous drainage, as well as nephrostomy tube or ureteral stenting if urinary obstruction is present.

Case report

A 51-year-old male with end-stage renal disease secondary due to polycystic kidney disease status-post two renal transplants (right lower quadrant, 2003 that failed secondary to malignant hypertension, left lower quadrant, 2015) was transferred from outside hospital for critical care management of sepsis due to E coli bacteremia, and acute renal failure requiring hemodialysis. The patient had no history of recurrent infections. Initial abdominal and pelvic CT scan on admission was unremarkable, demonstrating atrophic native kidneys and bilateral lower quadrant transplanted kidneys, the right appearing atrophic. Initial management included intubation, pressors and broad-spectrum antibiotics and his clinical status stabilized.

On day six of admission, he was weaned off pressor support and successfully extubated. Due to poor urine output and ongoing need for dialysis, transplant ultrasound was performed and abdominal X-ray noted the development of new renal parenchymal gas consistent with EPN (Fig. 1). Repeat CT confirmed the diagnosis (Fig. 2). The patient's management was escalated and a percutaneous drain was placed into the peri-renal space around the affected renal parenchyma.

Despite drainage, his clinical picture declined; he required increasing pressor support and was re-intubated. He was taken emergently to the OR for a nephrectomy, performed via an 8cm left lower quadrant modified Gibson incision over the previous transplant incision. Grossly, the infected kidney was soft and boggy – it appeared infarcted with evidence of liquefaction necrosis (Fig. 3). The bed was irrigated and a drain was left in situ. Pathology indicated evidence of endarteritis and chronic transplant arteriopathy, arterial thrombi with cortical infarctions, thrombotic microangiopathy, and micro abscess formation.

Two days following nephrectomy, he was extubated and pressor support discontinued. Unfortunately, he developed progressive ischemia secondary to prolonged pressor use in the setting of peripheral artery disease requiring bilateral amputation (initially transmetatarsal amputation followed by bilateral knee amputation over several months). He

Abbreviations: EPN, emphysematous pyelonephritis; CT, computed tomography.

* Corresponding author.
E-mail address: nathan.wong@wmchealth.org (N.C. Wong).

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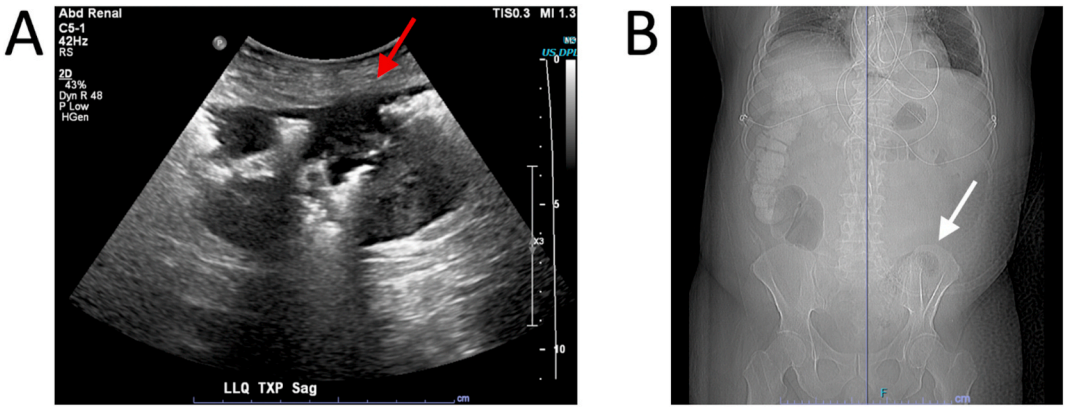

Fig. 1. A) Ultrasonography of the left renal transplanted kidney demonstrating evidence of intraparenchymal gas (red arrow). B) Abdominal X-ray demonstrating evidence of gas in the left lower quadrant suspicious for emphysematous pyelonephritis of the left transplant kidney (white arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

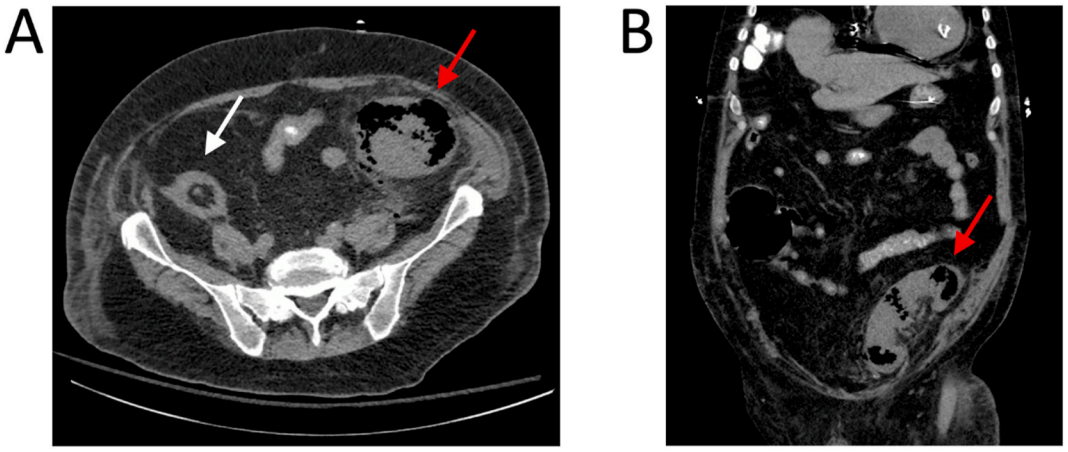

Fig. 2. Computerized tomography scan (confirming diagnosis of emphysematous pyelonephritis of the left renal transplant identified by the red arrow. A) Axial view and B) coronal view. The prior failed right renal transplant is marked by the white arrow. (For interpretation of the references to colour in this figure legend, the reader is referred to the Web version of this article.)

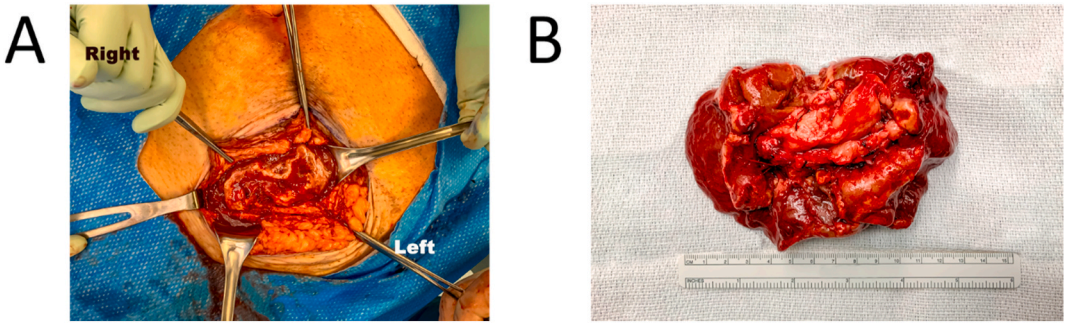

Fig. 3. A) The left transplant nephrectomy was removed using a modified Gibson's incision. B) Final gross pathology demonstrates evidence of parenchymal destruction without evidence of purulent discharge.

ultimately developed worsening sepsis related to lower limb extremity tissue necrosis and passed away secondary to cardiopulmonary arrest.

Discussion

The management of EPN has evolved drastically over the recent years managed almost exclusively with emergency nephrectomy historically with a shift towards more conservative nephron sparing management with intravenous antibiotic therapy and percutaneous drainage, except in cases of extensive diffuse gas with renal destruction where the gold standard remains nephrectomy. Management differs depending on whether the affected kidney is native or transplanted, and whether surgery would result in the need for permanent dialysis.

EPN can be divided into class 1–4 depending on the severity of the disease, with class 1 disease involving only gas in the collecting system, class 2 extending to the renal parenchyma, class 3A and 3B extending into the perinephric and paranephric spaces respectively, and class 4 disease involving all functional kidneys. Conservative management is

generally preferred for class 1 and class 2 disease including use of parenteral antibiotic therapy and possible percutaneous drainage.[1] Although conservative treatment decreases the number of unnecessary nephrectomies, it is more prone to failure. Risk factors associated with a failure included severe hypoalbuminemia, polymicrobial infection, and need for hemodialysis.[2]

Our patient was septic and, in this setting, the risk of mortality increases 3-fold in the renal transplant recipient.[3] In the setting of a transplanted kidney, there has been some success with conservative management. In one reported case, EPN caused by an extended spectrum beta-lactamase Klebsiella Pneumonia affecting >50% of the renal parenchyma and perinephric space was successfully treated with percutaneous drainage and 6 weeks of IV meropenem.[4] Serial CTs were conducted and the renal parenchyma had returned to normal on day 17 with the percutaneous drain removed on day 23. At 4 month follow-up, ultrasound showed a normal renal allograft.

However, conservative management may not always be successful. In another reported case, a patient with stage 3 EPN due to *Escherichia coli* was initially treated with percutaneous drainage as well as piperacillin-tazobactam without improvement after 48 hours.[5] This patient required renal allograft nephrectomy, and following surgery required pressor support, hemodialysis and percutaneous drainage of a post-operative abdominal abscess.

We chose to initially manage this patient conservatively using empiric antibiotics and drainage with the hope of preserving renal parenchyma and need for long term dialysis. However, the patient developed worsening sepsis requiring emergent allograft nephrectomy. This case underlines the importance of close observation and serial imaging in the setting of EPN to monitor the infection's progression and despite early percutaneous drainage, patients may fail and deteriorated requiring subsequent nephrectomy. As it is likely that the delay in definitive nephrectomy and need for prolonged pressor support most likely contributed to the poor outcome, conservative management should be utilized in well selected patients.

Conclusion

We present a complicated case and the evolving management of a patient with a complex renal transplant history who developed EPN of the transplant kidney. He was initially managed conservatively with antibiotics and drainage but required subsequent emergent nephrectomy. EPN is a rare condition with an associated high mortality rate – early diagnosis and management are critical and understanding prognosis and deciding who should undergo surgical versus conservative management is critical.

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References

1. Aswathaman K, Gopalakrishnan G, Gnanaraj L, Chacko NK, Kekre NS, Devasia A. Emphysematous pyelonephritis: outcome of conservative management. *Urology*. 2008;71(6):1007–1009. https://doi.org/10.1016/j.urology.2007.12.095.
2. Lu Y-C, Chiang B-J, Pong Y-H, et al. Predictors of failure of conservative treatment among patients with emphysematous pyelonephritis. *BMC Infect Dis*. 2014;14. https://doi.org/10.1186/1471-2334-14-418.
3. Jackson KR, Motter JD, Bae S, et al. Characterizing the landscape and impact of infections following kidney transplantation. *Am J Transplant*. 2021 Jan;21(1):198–207. https://doi.org/10.1111/ajt.16106. Epub 2020 Jun 28. PMID: 32506639.
4. Alexander S, Varughese S, David VG, et al. Extensive emphysematous pyelonephritis in a renal allograft treated conservatively: case report and review of the literature. *Transplant Infect Dis Off J Transplant Soc*. 2012;14(6):E150–E155. https://doi.org/10.1111/tid.12016.
5. Agreda Castañeda F, Lorente D, Trilla Herrera E, et al. Extensive emphysematous pyelonephritis in a renal allograft: case report and review of literature. *Transplant Infect Dis Off J Transplant Soc*. 2014;16(4):642–647. https://doi.org/10.1111/tid.12246.