Annals of Clinical Cases

ISSN: 2692-7993

Mini Review

Emphysematous Pyelonephritis: Not that Lethal Anymore

Chittibabu KT, Sriram Krishnamoorthy and Natarajan Kumaresan*

Department of Urology, Sri Ramachandra Institute of Higher Education & Research (SRIHER), India

Abstract

Emphysematous Pyelonephritis is an acute life-threatening infection of the kidney that causes severe damage to the functioning renal parenchyma. The disease is characterized by presence of necrotizing infection with formation of gas in the renal collecting system or the parenchyma. Diabetes mellitus is considered to be a major factor that predisposes to this condition. High tissue and urine sugar levels and immune-compromised status in diabetics make them more prone for the disease.

Apart from high blood sugar levels, thrombocytopenia, bilateral involvement, hypotension, altered sensorium and elevated serum creatinine levels were known to be associated with poorer outcome. Huang and Tseng classified EPN based on location and extent of gas in the kidneys in Computed Tomography (CT) scan. He classified EPN into 4 types. class 1 included gas in the pelvi-calyceal system; class 2 containing gas in the renal parenchyma; class 3A showing extension of gas beyond the renal capsule into the perinephric space; Class 3B showing extension of gas or abscess to the pararenal space and Class 4 includes cases of bilateral EPN or a EPN in solitary kidney.

The factors that decides the ultimate outcome would be prompt diagnosis, fluid and electrolyte balance, administration of broad spectrum antibiotics, early and prompt decompression of the pelvi-calyceal system by Double J stenting or by percutaneous nephrostomy and a high index of clinical suspicion. Rarely, if damage to the kidney is very extensive and if the patient can withstand surgical intervention, Nephrectomy is indicated.

Keywords: Emphysematous; Pyelonephritis; Nephrectomy; Nephrostomy; Infection; Diabetes mellitus

Introduction

Emphysematous Pyelonephritis (EPN) is an acute necrotizing infection of the kidney characterized and diagnosed by presence of gas in the collecting system or in the renal parenchyma. It is more common in females, explained by higher incidence of urinary tract infections [1]. It is usually caused by glucose-fermenting gram negative bacteria, most frequently by *Escherichia coli* but also by *Klebsiella pneumonia*, and *Proteus mirabilis*. Sometimes, anaerobic and fungal infections can also cause EPN [2]. Since the clinical and laboratory findings can only suggest an on-going inflammation and infection in the urinary tract, imaging becomes necessary to make an accurate diagnosis. A prompt and accurate radiological diagnosis is the cornerstone for confirmation of EPN and also to plan the appropriate management.

Radiological diagnosis

Plain X-ray KUB shows mottled gas with crescent shaped gas collection within Gerota's fascia [3]. However, plain radiography has its own inherent limitations in making a diagnosis. Excretory urogram may show a delayed excretion of contrast medium on the affected side. However, the major limitation is that in cases of non-visualized kidney, the imaging becomes meaningless.

Ultrasound is useful in the diagnosis of EPN. It shows an enlarged kidney with coarse hyperechogenic areas within the renal parenchyma or the pelvi-calyceal system, with the characteristic 'dirty acoustic shadows' [4]. This posterior acoustic shadow is created by the reverberations from gas and this can often be confused with acoustic shadow caused by renal calculi. Artifacts can be observed whenever accumulates within the renal pelvis or in the parenchyma. This may be due to air pockets getting trapped within the fluid collection. Ultrasound is less reliable especially when the intestines or colon are distended with gas or in the presence of a diffuse retroperitoneal gas, where it becomes difficult to visualize the finer details of the renal architecture.

Computed Tomography (CT) is the gold standard investigation that confirms EPN. CT scan gives an accurate estimation of the extent of parenchyma destruction. Presence of gas and the fluid can be accurately diagnosed. CT also gives us an assessment of the degree of hydronephrosis that can happen either by the presence of co-existent stones at the pelvi-yreteric junction or necrosed papillae. Usually the affected kidney appears enlarged and edematous. Other features like perinephric fat stranding and focal areas of necrosis and abscesses may correlate directly with the severity of the disease. Rim enhancement within the affected renal parenchyma indicates focal abscess formation. Any decreased parenchyma enhancement should

Citation: Chittibabu KT, Krishnamoorthy S, Kumaresan N. Emphysematous Pyelonephritis: Not that Lethal Anymore. Ann Clin Cases. 2020;1(3):1011.

Publisher Name: Medtext Publications LLC

Manuscript compiled: July 09th, 2020

***Corresponding author:** Sriram Krishnamoorthy, Department of Urology, Sri Ramachandra Institute of Higher Education & Research (SRIHER), Chennai, 600116, India, Tel: +918056139257; E-mail: sriramuro@gmail.com

raise suspicion of thrombus in renal artery and vein. The differential diagnosis may include renal abscess and infarction [5]. Figure 1 illustrates the CT diagnosis of EPN. Figure 1A shows an edematous left kidney with the renal parenchyma containing air pockets within it. Figure 1B shows air pockets in both the kidneys, suggestive of bilateral EPN.

Classification

Several classification methods for EPN exist. This earlier classification from Michaeli et al. [6] was based on Plain X-ray KUB and excretory urography. They described stage I as gas in the renal parenchyma, stage II as when gas in the kidney and its surroundings. Stage III describes extension of gas through the para-renal fascia or bilateral disease. This classification is largely replaced by the Huang et al. [7] radiological classification that is considered to have a better clinical utility.

Huang and Tseng classified EPN into 5 categories based on CT findings [7]. In class 1, gas is confined to the collecting system only. In class 2, gas is found in the renal parenchyma without extrarenal extension. Class 3 is divided into 3A and 3B. In class 3A, gas extends into the perinephric space and in class 3B; gas extends into the pararenal space. Involvement of both kidneys and EPN in solitary kidney are included as class 4.

Another classification system based on CT finding is by Wan et al. [8], differentiating EPN into two types. Though this classification gives inadequate details of the stage of the disease, it provides a better assessment of the clinical outcome. Type 1 shows damage to the renal parenchyma giving a characteristic streaky or mottled appearance due to air in the kidney. Fluid collections are characteristically absent, suggesting a suboptimal immune response. Type 2 is characterized by renal or perirenal fluid collections associated with gas within pelvicalyceal system and ureter. Type 1 is aggressive and warrants earlier diagnosis and prompt treatment. Type 2 has a better prognosis.

Treatment

Until 3 decades before, EPN carried a very high mortality of up to 40%. Emergency Nephrectomy was the then accepted initial modality of treatment [9]. But with an increased awareness amongst the urologists and physicians, an early diagnosis is made. With the use of minimally invasive techniques, such cases are being treated more conservatively well before any damage has occurred to kidneys. Such techniques have significantly reduced the overall mortality and have largely obviated the need for early Nephrectomy [10]. In the last decade, with outcome in these patients is being assessed by various prognostic scoring systems, more and more of EPN cases are managed conservatively and by minimally invasive techniques [11,12]. Figure 2 describes the role of percutaneous drainage of the perinephric collection in EPN patients. Figure 2A illustrates the hugely inflamed and edematous kidney that has lost its reniform shape, due to the large collection (arrow mark). Figure 2B illustrates a near complete recovery of the right kidney after decompression by per-cutaneous drainage, where the collection has significantly reduced and the renal parenchyma regained its architecture.

Conclusion

The concept of management of EPN patients has undergone massive change in the last decade. The overall mortality has significantly reduced. Patients with minimal or no risk factor can be managed either conservatively, Double J stenting or by radiology guided percutaneous drainage. Supportive measures like oxygen supplementation, intravenous fluid administration and culture sensitive antibiotics along with correction of acid-base balance and blood sugar levels would greatly help in recovery in such patients. Patients who fail to respond to conservative measures or minimally invasive methods and those who fall in poor prognostic category might benefit from Nephrectomy.

References

1. Eswarappa M, Suryadevara S, John MM, Kumar M, Reddy SB, Suhail M. Emphysematous Pyelonephritis Case Series from South India. Kidney Int Rep. 2018;3(4):950-5.
2. Tang HJ, Li CM, Yen MY, Chen YS, Wann SR, Lin HH, et al. Clinical characteristics of emphysematous Pyelonephritis. J Microbiol Immunol Infect. 2001;34(2):125-30.
3. Langston CS, Pfister RC. Renal emphysema. AJR Am J Roentgenol. 1970;110(4):778-86.
4. Grayson DE, Abbott RM, Levy AD, Sherman PM. Emphysematous infections of the abdomen and pelvis: A pictorial review. Radiographics. 2002;22(3):543-61.
5. Craig WD, Wagner BJ, Travis MD. Pyelonephritis: Radiologic-pathologic review. Radiographics. 2008;28(1):255-76.
6. Michaeli J, Mogle P, Perlberg S, Hemiman S, Caine M. Emphysematous pyelonephritis. J Urol. 1984;131(2):203-8.
7. Huang JJ, Tseng CC. Emphysematous Pyelonephritis: Clinicoradiological classification, management, prognosis, and pathogenesis. Arch Intern Med. 2000;160(6):797-805.

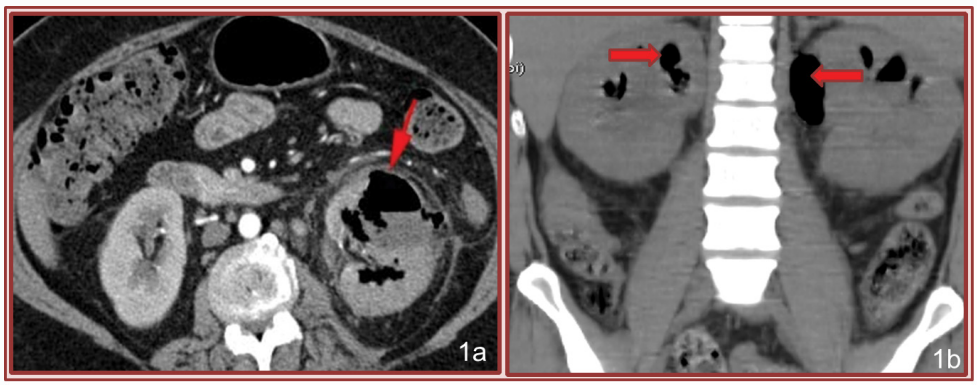

Figure 1: CT findings of EPN.
Figure 1A: shows bulky left kidney with air pockets (red arrow) in the collecting system.
Figure 1B: shows air pockets in both kidneys, suggestive of bilateral EPN.

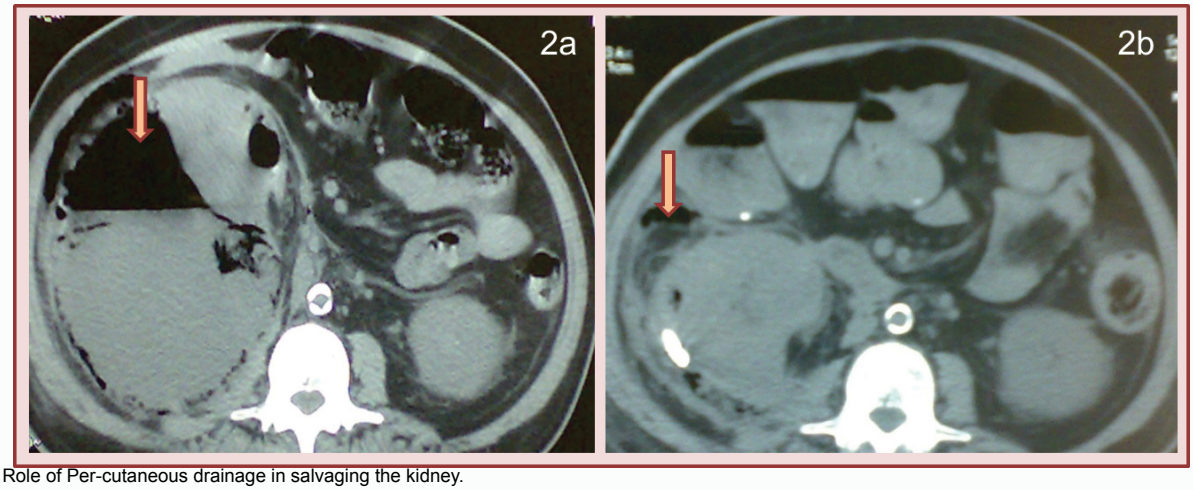

Figure 2: Role of Per-cutaneous drainage in salvaging the kidney.
Figure 2A: Shows an edematous right kidney with a huge air pocket, damaging the renal parenchyma (red arrow).
Figure 2B: Depicts the CT image of the same kidney, taken 2 weeks after drainage tube placement.

8. Wan YL, Lee TY, Bullard MJ, Tsai CC. Acute gas-producing bacterial renal infection: correlation between imaging findings and clinical outcome. Radiology. 1996;198(2):433-8.

9. Shokeir AA, El-Azab M, Mohsen T, El-Diasty T. Emphysematous pyelonephritis: a 15-year experience with 20 cases. Urology. 1997;49(3):343-6.

10. Alsharif M, Mohammedkhalil A, Alsaywid B, Alhazmy A, Lamy S. Emphysematous pyelonephritis: Is nephrectomy warranted? Urol Ann. 2015;7(4):494-8.

11. Jain A, Manikandan R, Dorairajan LN, Sreenivasan SK, Bokka S. Emphysematous pyelonephritis: Does a standard management algorithm and a prognostic scoring model optimize patient outcomes? Urol Ann. 2019;11(4):414-20.

12. Prakash JVS, Muthu MT, Balaji AR, Vetrichandar S, Arasi KV, Natarajan V, et al. A Novel Prognostic Scoring System for Emphysematous Pyelonephritis. J Urol Ren Dis. 2019;04:1170.