



Emphysematous Pyelonephritis: Changing Trends in Last Two Decades

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Abstract

Emphysematous pyelonephritis is an acute necrotizing infection of the kidney, produced by gas-forming bacterial and fungal infections. The magnitude of the problem, its impact on the kidney, ultimate kidney salvage ability has seen a drastic improvement in the last two decades. From the time Schultz coined this term in 1962, the concepts involving diagnosis and management have been constantly evolving. Diabetes mellitus continues to wreak havoc by allowing a strong platform for the gas-forming organisms to proliferate and destroy the renal parenchyma. Infective organisms range from gram-negative bacteria to *Cryptococcus* and *Candida* species. Early nephrectomy, which was one of the life-saving measures two decades back, has almost become obsolete now. Minimally invasive procedures including double-J placement, percutaneous nephrostomy and percutaneous drainage have become the standard of care in most patients. Assessment of prognosis and choosing appropriate treatment is largely based on the prognostic scoring systems and risk stratifying strategies.

With improved diagnostic methods, high awareness amongst treating physicians and early and prompt treatment has made EPN a manageable disease with rapid recovery and less mortality.

Keywords: Emphysematous pyelonephritis; Nephrostomy; Double J stent; *Candida albicans*

Background

Emphysematous Pyelonephritis (EPN) is one of the potentially lethal infections of the kidney, where the renal parenchyma and the perirenal tissues are interspersed with and largely replaced by gas formation. Considered once upon a time a dreaded disease with a high fatality rate, the understanding of the pathophysiology of this disease has undergone a paradigm change in the last two decades, as a result of which, the mortality from EPN has considerably reduced. This editorial focuses on the impact that EPN had on humankind in the late 1990s and how in the past two decades, an increased awareness, prompt evaluation, aggressive glycemic control and appropriate management with minimally invasive methods have largely reduced the mortality from this disease.

The magnitude of the problem

The overall incidence of EPN is difficult to estimate and no specific data is available in the literature. The earliest reports from Schultz reported a case of EPN (who coined this term in 1962) in a diabetic lady who finally succumbed to the illness, despite undergoing Cystoscopy and retrograde ureteric catheterization [1]. The reports published before that used the terms pneumonephrosis and pneumopyelonephrosis and renal emphysema [2-4]. With an increase in imaging techniques and a high index of clinical suspicion, more and more EPN cases are being diagnosed these days. Though the number of cases is high, with an appropriate diagnosis being made within the vital period of the window of curability, the need for nephrectomy has drastically come down.

Diabetes and EPN

The problem of EPN correlates with the extent of infection with gas-forming/fermenting organisms [5]. Vivek et al. and Kapoor et al. [6,7] and many other studies identified uncontrolled high sugar levels in blood with impaired tissue perfusion as the main predisposing factor in such patients. However, Irfaan et al. and Eshwarappa et al. [8,9] did not find hyperglycemia to be one of the significant prognostic factors in causing EPN. Ubee et al. [10] report that 95% of EPN cases are seen in diabetics. In the largest ever number of EPN cases published by this author, diabetes constituted one of the strongest predisposing factors that decided the outcome in EPN patients [11]. Similar observations were noted by yet another large study in South India, where diabetes constituted the single most important prognostic factor [12].

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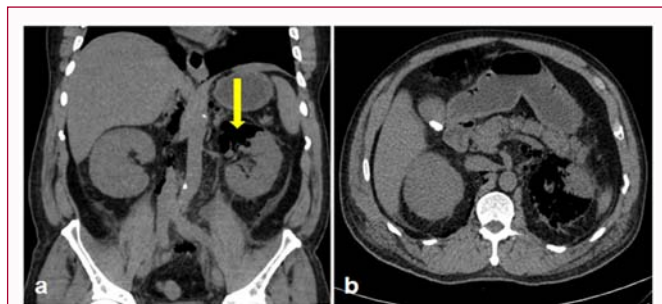


Figure 1: Coronal (1a) and Axial (1b) sections of CT scan of the abdomen showing the entire upper pole of the right kidney being replaced by gas formation.

Changes in the bacterial spectrum

Gram-negative septicemia with *E. coli* infection is seen in nearly 70% of EPN patients with positive urine culture [13]. On the other hand, in those who needed nephrectomy or succumbed to the illness, anaerobes and a mixture of organisms predominate. With diabetics and immunocompromised patients on the rise, fungal and cryptococcal infections are being increasingly reported [14]. As these fungal infections are characteristically missed out in routine bacterial cultures, it is prudent to look for fungal hypha in urine microscopy in all these individuals.

Mortality then and now

EPN was once considered a lethal disease. In one of the earliest reports in 1985, Ahlering et al. [15] observed a mortality rate of 42% in their EPN cases. There was an observation that younger individuals were affected by more virulent forms of EPN and mortality at a younger age is high. They also observed that alcoholics and diabetes carried a higher risk of death from EPN. The right kidney was noted to be associated with more deaths than the left one, owing to its proximity to the inferior vena cava and the liver. Early nephrectomy was found to be more life saving than the delayed one.

Progress made in the last two decades

Pontin et al. [16] in 1995 reported 22 cases of EPN, of which 18 underwent early nephrectomy. The same authors in 2009 concluded that nephrectomy could be avoided in a majority of patients by an early diagnosis and appropriate treatment [17]. With the increasing usage of axial imaging, the extent of damage to kidneys can be assessed with a high degree of accuracy, obviating the need for nephrectomy in a majority of patients. With the present day Helical Computed Tomography (CT) scan, the extent of lesions can be delineated with highest degree of accuracy. Figure 1 illustrates the clinical utility of CT scan in making a diagnosis of EPN. An upper polar gas (yellow arrow) formation completely replacing the upper pole of the right kidney is well documented in the coronal (Figure 1a) and axial sections (Figure 1b) respectively. Prognostic factors that determine the outcome in EPN patients and the risk stratification scoring systems and use of minimally invasive techniques have largely reduced the need for nephrectomy in a majority of cases and have significantly reduced the mortality as well. Prakash et al. introduced a Stanley scoring system to triage those EPN patients who need closer monitoring and aggressive management [18].

Future perspectives

With an increased awareness amongst the emergency room physicians about this condition, it becomes a lot easier for one to

make an early diagnosis of EPN. Management of EPN in future might be investigation based and purely mathematical. With axial imaging available everywhere round the clock and with increasing use of prognostic scoring systems and risk stratification strategies made available, it would be surprising if there is any delay in diagnosis or initiation of treatment of EPN patients. Validation of NEWS II scoring systems in EPN patients would further augment the renal salvage ability in patients with EPN.

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