

Retrospective Analysis Of Emphysematous Pyelonephritis: Single Centre Experience Of Ten Cases

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Abstract

Introduction: Emphysematous pyelonephritis (EPN) is a rare, acute necrotizing infection of the renal parenchyma with a high mortality and morbidity. We herein present the retrospectively analyzed data of ten cases.

Materials and methods: This single centre study retrospectively analyzed the data of ten cases of emphysematous pyelonephritis.

Observation and results: Demographic profile, history of diabetes mellitus and various clinical and laboratory parameters including kidney function, thrombocytopenia, leucocytosis and glycosylated haemoglobin were noted. CT scan, done to reveal severity of renal involvement, showed type I EPN in two patients, type II EPN in three patients, type III EPN in four patients and type IV in one patient. All patients with class I/II were treated without need for nephrectomy while 60 % (3/5) patients in class III/IV required nephrectomy. There was no mortality in class I/II whereas it was 40% in class III/IV.

Conclusion: EPN requires early diagnosis with the aid of ultrasonography and computed tomography. Clinical course and outcome is worse for class III/IV patients.

INTRODUCTION

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Conclusion: EPN requires early diagnosis with the aid of ultrasonography and computed tomography. Clinical course and outcome is worse for class III/IV patients.

MATERIALS AND METHODS

This single centre study retrospectively analysed the data of

ten cases of emphysematous pyelonephritis, admitted from 2008-20011. After collection of data, the following points were noted:

- Age, gender
- Duration of symptoms
- Associated diabetes mellitus
- Clinical picture
- Organism cultured
- Unilateral versus bilateral renal involvement
- Huang & Tseng CT classification of EPN
- Treatment modality used(nephrectomy or PCN/internal stenting)
- Presence of ARF, thrombocytopenia/DIC/septic shock
- Duration of hospital stay
- Mortality.

For the purpose of present study, following definitions were used:

- A) EPN: symptoms and sign of UTI, fever with positive urine culture without any identifiable cause for the same, presence of gas in the kidney and or perirenal space, and lack of communication between the urinary tract and bowel
- B) Sepsis: presence of two or more of the following conditions as a result of infection: temp>38 c or < 36c, heart rate > 90 bpm, PaCO₂ < 32 mm Hg, TLC < 4000 or > 12000 and > 10% band forms.

C) Thrombocytopenia: platelet < 1.2 lakhs

When thrombocytopenia and DIC co existed, thrombocytopenia was considered as a part of DIC.

D) Shock: SBP < 90 mmHg.

OBSERVATIONS AND RESULTS

The mean age of our patients was 60 years (37-75years). Women outnumbered men with a female to male ratio of 4:1. All our patients were known diabetic for over 5 years, and 70% of them had diabetic retinopathy. The left kidney was more commonly involved than the right (3:1). All the patients had culture positive UTI with E. Coli being the most common organism (70%) and proteus mirabilis the second most common (20%). Bacteremia was identified in 60 % (6/10) cases and all had similar organism cultured between the blood and urine specimen. However, of importance is that no anaerobic organism was cultured. Three of the patients had acute renal failure, with one of them having serum creatinine value greater than 5mg%. Isolated thrombocytopenia was present in two patients while four patients had evidence of sepsis. CT scan, done to reveal severity of renal involvement, showed type I EPN in two patients, type II EPN in three patients, type III EPN in four patients (fig 1). Only one of our patients had bilateral involvement.

Table 1

HbA1c: glycosylated haemoglobin, UTI: urinary tract infection UPJ: ureteropelvic junction calculus, CT: computed tomography

Mean age	47years
Gender	F:M 4:1
Uncontrolled Diabetes mellitus	100%
Clinical features:	
Fever	100%
Flank/abdominal pain	40%
Mental obtundation	10%
Shock	30%
Laboratory parameters	
HbA1c >8	30%
Leucocytosis	80%
Thrombocytopenia	30%
Culture positive UTI	60%
Bacteremia	
ORGANISM CULTURED:	
E. coli	70%
Proteus	20%
K. pneumoniae	10%
CT classification(Huang & Tseng)	
TYPE I	2
TYPE II	3
TYPE III	4
TYPE IV	1
Associated urinary tract obstruction	100% (4/10- UPJ calculus, 3/10-ureteral calculus, thick debris 3/10)

Patients having class I & II EPN (5/10) had normal renal function and were resuscitated with IV fluids, electrolyte

imbalances and deranged blood sugars corrected and parenteral antibiotics were started. All of these patients had their renal systems drained by PCN done under local anaesthesia. All of them recovered and were discharged after seven days.

Two patients with EPN class III were treated with DJ stenting and ultrasound guided perinephric drain insertion under local anaesthesia. They had longer duration of hospital stay (10days) owing to the need for parenteral antibiotics. The remaining two patients in this class underwent nephrectomy after adequate resuscitation owing to the presence of thrombocytopenia, acute renal failure despite dialysis support and unresponsive septic shock. One of these patients succumbed to his illness after 48 hours of surgery owing to refractory septic shock, while the other had a satisfactory improvement. The solitary patient with bilateral EPN was resuscitated and underwent B/L PCN with left ICD (owing to presence of left empyema). He was started on haemodialysis due to ARF (serum creatinine 6.8). However due to unresponsive septic shock, patient underwent left nephrectomy (owing to more severe left involvement). This patient also died due to septic shock.

The overall mortality in our study group was 20% and was present only in group III/IV, leading to a group specific mortality of 40%(2/5). A comparison of clinical and laboratory parameters of the groups of patients having EPN I/II vs EPN III/IV is outlined in table 2.

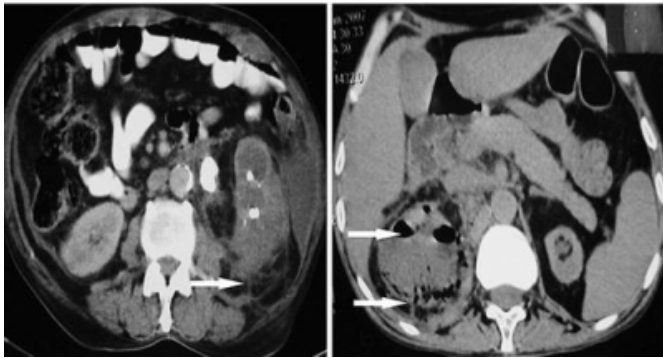
Table 2

HbA1c: glycosylated haemoglobin, CT: computed tomography

Severity on CT Scan	I / II	III / IV
Mean age	50 years	55 years
Average HbA1c	8%	9.5%
Diabetic retinopathy	Present in 40%	Present in 100%
Urinary tract obstruction	100%	100%
Duration of symptoms	3-7 days	10 – 18 days
Thrombocytopenia	None	All
Acute renal impairment	None	One
Mental obtundation	None	One
Shock	None	Two
Presence of risk factors	One	Two or more
Group specific mortality	None	40%
Need for nephrectomy	None	60% (3/5)

Figure 1

CECT abdomen showing gas in the renal parenchyma (marked by arrows)



DISCUSSION

Emphysematous pyelonephritis is a severe, necrotizing form of acute bacterial

Pyelonephritis and *Escherichia coli* remains the most common causative pathogen; the organism has been isolated on urine or pus cultures in nearly 70% of the reported cases.³ Other uncommon causative organisms include *Proteus mirabilis*, *Klebsiella pneumoniae*, Group D *Streptococcus* and coagulase-negative *Staphylococcus*.⁴ Bacteremia is present in approximately half of patients and almost always the same organism is cultured from the blood and urine.⁵

Various factors have been suggested to be involved in the pathogenesis of EPN and include reduced host immunity, uncontrolled diabetes mellitus, and presence of obstruction within urinary tract, reduced renal vascularity and infection with *E. Coli*/gas forming organisms. A high level of glucose in the tissues with impaired vascularity in diabetics is responsible for a higher predilection for anaerobic fermentation and gas production (carbon dioxide and hydrogen) with the tissues.³

Diagnosis of EPN can be difficult clinically, and should be suspected in all patients with severe form of disease, especially in immune-compromised hosts. Plain X-ray KUB may show presence of renal calculi and mottling by gas in the renal and perirenal space in up to a third of the patients.⁶ Ultrasonography of the abdomen can demonstrate gas, fluid collections, and urinary tract obstruction, and may be helpful in guiding the placement of percutaneous drainage catheter if collection is seen.⁷ Currently, the most useful tool in assessing the extent of disease and helping in planning management is the CT. Huang and colleagues proposed 4 classes of EPN based on CT to prognosticate the disease and guide management: class I, gas presence in collecting system

only (emphysematous pyelitis); class II, gas presence in renal parenchyma without extension to extrarenal area; class IIIA, gas and/ or abscess presence in perinephric space; class IIIB, gas or abscess in pararenal area; class IV, bilateral EPN of any class or EPN in solitary kidney.⁵

Initial management of EPN consists of fluid resuscitation, glycemic control, and broad spectrum antibiotics. Additionally, patients with EPN 1 & II may require PCN/internal stenting to drain an obstructed system. Patients with class III EPN and absence of any adverse factors (thrombocytopenia, ARF, mental obtundation, shock) may be managed similarly with surgery being reserved for patients not improving.^{4,5} Type IV EPN group patients have worst prognosis and undergo percutaneous drainage, initial resuscitation, appropriate antibiotics and ultimately require nephrectomy.⁵

The presence of diabetes mellitus, older age, female gender or associated nephrolithiasis is not associated with a worse outcome. In fact, poor prognostic factors for EPN include presence of thrombocytopenia, DIC, mental obtundation, systolic blood pressure <90 mm Hg, grade III/IV disease on CT, and conservative management of higher grade disease.⁸

CONCLUSION

EPN requires early diagnosis for which a high index of suspicion is essential. Urgent diagnostic measures, including ultrasonography and CT, are essential.

Prompt therapeutic measures include infection and glycemic control, drainage of perinephric collection, relief of ureteric obstruction and nephrectomy, wherever necessary.

Patients with class III/IV have a worse prognosis and need individualised treatment in a high dependency unit.

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