



CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH EMPHYSEMATOUS PYELONEPHRITIS – EXPERIENCE AT A TERTIARY CARE HOSPITAL

Urology

Dr. Sandeep Maheswara Reddy Kallam

M.S., General Surgery, Post Graduate in Department of Urology, Guntur Medical College, Guntur.

Dr. M. Prabhakara Rao*

M.S., M.Ch., Urology, Assistant Professor in Department of Urology, Guntur Medical College, Guntur. *Corresponding Author

ABSTRACT

INTRODUCTION: Emphysematous pyelonephritis (EPN) is an acute necrotizing infection of renal parenchyma. We discuss clinical details and treatment modalities of 45 patients with EPN followed at our hospital. EPN is common in persons with uncontrolled diabetes, often has a fulminating course and can be fatal if not recognized and treated promptly. Its overall mortality rate ranges between 19% and 43%.³

METHODS: We retrospectively reviewed the clinical, laboratory, radiological findings and treatment modalities of 45 patients with EPN followed at our hospital between 2014 and 2018.

RESULTS: A total of 45 patients were included in our study. Mean age of the patients was 59 years with age range of 42 – 80 years. Out of 45 cases 42 patients were a known case of type 2 diabetes. All patients were initially managed by strict diabetic control, fluid and electrolyte correction and IV antibiotics. Nephrostomy tube was placed in 13 patients and nephrectomy was done in 4 patients. 4 patients died post operatively. At 6 months follow up patients with class I and class II had creatinine levels within normal range. Patients who underwent nephrostomy in class III A and Class III B creatinine levels ranged between 1.8 to 2.3 mg/dl.

CONCLUSION: Mortality rates of EPN are gradually decreasing all over the world. Preservation of renal parenchyma is possible due to early diagnosis, appropriate antibiotic therapy, and drainage.

KEYWORDS

Emphysematous Pyelonephritis, E. coli, Diabetes, Nephrostomy

INTRODUCTION:

Emphysematous pyelonephritis is a rare severe necrotising infection of the renal parenchyma and peri-renal tissue.¹ It is life endangering suppurative infection associated with gas formation within the collecting system, renal parenchyma, and / or peri-renal tissue. This disease is common in patients with diabetes and has a fulminant course and can be fatal if not recognised and treated promptly. Gas in the renal pelvis alone without parenchymal involvement is referred as emphysematous pyelitis. Chills, fever, flank pain, lethargy, confusion, nausea and vomiting, abdominal pain, dysuria, shock and coma are the most clinical presentations of emphysematous pyelonephritis. Pneumaturia is usually absent unless it coexists with emphysematous cystitis². Its overall mortality rate ranges between 19% and 43%.³ Early diagnosis and effective treatment reduces the mortality and morbidity of EPN. In this study we have discussed the clinico-radiological profile, treatment modalities and outcome of patients with emphysematous pyelonephritis.

METHODS:

We reviewed the records of 45 patients admitted in our hospital with emphysematous pyelonephritis over a period of 5 years from 2014 to 2018 and noted the clinical, laboratory reports, radiological findings, treatment modalities and outcomes of the patients and details were analysed. Past history of any diabetes and their glycemic control was noted. All patients underwent CT and classified according to Huang and Tseng classification.² Patients were followed up for 6 months and outcomes and prognosis was noted.

RESULTS:

A total of 45 patients were included in our study. Mean age of the patients was 59 years with age range of 42 – 80 years. Out of 45 cases 42 patients were a known case of type 2 diabetes. All had a poor glycemic control.

Table 1: Clinical profile and laboratory findings of the patients with emphysematous pyelonephritis (n=45)

		No of patients	Percentage
Sex	Male	17	38%
	Female	28	62%
Clinical presentation	Fever	45	100%
	Flank pain	22	49%
	Nausea and vomiting	42	93%

	Pain abdomen	15	33%
	Renal angle tenderness	32	71%
	Altered consciousness	2	4%
	Hypotension	3	7%
	Pneumaturia	0	0
Past history	Type 2 DM	42	93%
	Renal stones	20	44%
	Unilateral	42	93%
	Bilateral	3	7%
Culture	E-coli	32	71%
	Klebsiella	2	4%
	Mixed	5	11%
Blood investigations	Elevated WBC	45	100%
	Elevated ESR	39	86%
	Elevated CRP	45	100%
	Thrombocytopenia	22	48%
	Elevated creatinine	38	84%

Renal calculi was present in 22 patients. Out of 45 patients 42 patients had unilateral emphysematous pyelonephritis of which 19 patients had right sided EPN and 26 patients had left sided EPN. Urine culture was sent for all the patients. It was positive for E. coli in 32 patients, Klebsiella in 2 patients and 5 patients showed mixed growth. There was no growth in 6 patients.

CT was performed in all patients for confirmation of diagnosis as well as classification.

Table 2 Radiological classification of emphysematous pyelonephritis according to Huang Tseng classification (n=45)

Class	No. of patients	Percentage
Class I	11	24%
Class II	16	35%
Class III A	8	18%
Class III B	7	15%
Class IV	3	8%

All patients were initially managed by strict diabetic control, fluid and electrolyte correction and IV antibiotics. Initially broad spectrum antibiotics were started which was later changed according to urine culture and sensitivity pattern.



Figure 1: CT scan showing gas in renal parenchyma (Class II)

Nephrostomy tube was placed in 13 patients who belonged to class III A and Class III B. Nephrectomy was done in 4 patients who belonged to class III b. Nephrectomy was done by lateral approach, Flank incision and extra peritoneal approach to avoid contamination of peritoneal cavity. After surgery, clinical condition rapidly improved and patients were transferred to the urology division. DJ stenting was done in 20 patients who had upper urinary tract obstruction. Out of 20 patients who had renal stones after initial stabilization, 15 members underwent endoscopic ureteral / renal stone removal. Remaining 5 members were treated with only antibiotics. Four patients belonging to class III B and IV died after nephrostomy and antibiotic therapy. Other patients were discharged.

At 6 months follow up patients with class I and class II had creatinine levels within normal range. Patients who underwent nephrostomy in class III A and Class III B creatinine levels ranged between 1.8 to 2.3 mg/dl.

DISCUSSION:

EPN is a necrotising infection of renal parenchyma and surrounding tissues. It is characterised by gas formation in renal parenchyma, collecting system or perinephric tissues. Kelly and McCallum reported the first clinical description of the disease in 1898.⁴ Primary organisms, which cause EPN can be normally found in the gastrointestinal and urinary system.

E. coli is the most common organism identified. Other microorganisms like *Klebsiella*, *Proteus* and *Streptococcus* can be identified. In very rare cases *Candida* and anaerobic organisms can be identified.^{5,6,7}

More than 90% of the patients are diabetic and it is seen 6 times more common in women than in men.⁵ In our study also findings were similar. In patients with diabetes, due to higher concentration of glucose in tissues hydrogen and carbon monoxide are released through sugar fermentation, which provides a suitable environment for the growth of microorganisms.⁹ In non-diabetic patients obstruction is usually the underlying cause.

The symptoms, findings and laboratory data of patients with EPN are nonspecific and cannot be discriminated from those of upper urinary system infection. Most common clinical symptoms include high fever, flank pain, nausea and vomiting. Pneumaturia may be seen only when it coexists with emphysematous cystitis. In our study too fever and flank pain were the most common symptoms. Huang and Tseng³ in their study found that thrombocytopenia (46%), acute renal function impairment (35%), disturbance of consciousness (19%) and shock can be initial presentations. Shokier et al⁸ found renal function impairment in 80% of their patients and shock and coma in 15% of the patients. In our study also we had similar findings with thrombocytopenia in 48%, renal impairment in 84% altered sensorium and shock in 11%. However these findings are non-specific and all suspected cases should undergo radiological evaluation as EPN has high mortality if not identified and treated early.

Diagnosis of EPN is made radiologically, with CT being the most definitive modality. EPN can also be diagnosed by abdominal X-ray and ultrasonography. In direct KUB (kidney – ureter – bladder) studies, ipsilateral psoas muscle image is effaced and gas bubbles are

observed on renal parenchyma, collecting system or peri-renal tissues. Although ultrasound is the first preferred method in most cases because of its non-invasiveness and easy applicability, it is mostly inadequate in establishing diagnosis and determining its spread. Since most of the patients, renal parameters are impaired at time of presentation intravenous urography cannot be performed.

CT images are useful to define the presence, extent, and position of gas within the renal parenchyma, beside any other associated renal pathology, like calculi, and / or presence of obstruction may also be evident on CT scan. Contrast-enhanced CT scan is better as it gives an idea about the function status of the renal units as well as it facilitates the description of the intraparenchymal gas (streaky, mottled, bubbly, rim like, crescent shaped, locular, and so on). However, in patients with deranged renal parameters, a non-contrast CT scan may suffice. In addition to diagnosis and staging of EPN, CT scan is also helpful in monitoring the response to treatment. It might show resolution of the gas and abscesses or the development of new lesions.

Staging of EPN is done radiologically based on the extent of gas in the renal parenchyma and surrounding tissues. It might be useful for decision making and prognostication. Langston and Pfister¹⁰ suggested a classification on the basis of abdominal X-ray and an intravenous urography, which was later modified by Michaeli *et al.*² They classified EPN into 3 classes.

Class I - Gas in renal parenchyma or perinephric tissue

Class II - Gas in the kidney and its surroundings

Class III - Extension of gas through fascia, or bilateral disease.

Wan *et al.*¹ classified the gas collection as type I or type II, on the basis of CT scans.

Type I: Renal necrosis with presence of gas but no fluid

Type II: Parenchymal gas associated with fluid in renal parenchyma, perinephric space, or collecting system.

Huang and Tseng³ also used CT to classify patients with EPN as follows:

Class I: Gas in collecting system only

Class II: Parenchymal gas only

Class IIIA: Extension of gas into perinephric space

Class IIIB: Extension of gas into para-renal space

Class IV: EPN in solitary kidney, or bilateral disease.

The classification by Huang and Tseng is a superior due to the better prognostic value and is also helpful in selecting a management protocol. In their study, class I and II patients, all survived following treatment with percutaneous procedures and medical therapy. While in patients belonging to class III or IV, those with fewer than two risk factors (i.e. thrombocytopenia, acute renal function impairment, disturbance of consciousness and shock) had an 85% survival rate with percutaneous drainage and medical therapy, whereas patients of class III or IV EPN and two or more risk factors had a 92% failure rate with percutaneous drainage and medical therapy. In their study, 33.33% of the patients belonged to class I or II while 66.66% of the patients belonged to class III or IV; while in our study, majority of the patients (64%) belonged to either class I or II while 36% of the patients belonged to class III or IV.

Management of EPN mainly consists of prevention and treatment of shock, correction of electrolyte imbalance, glycemic control and removal of underlying obstruction. Urine and blood cultures should be obtained and parental broad spectrum antibiotics should be administered based on susceptibility test results. Some studies reported success of medical monotherapy in some cases of EPN.¹¹ Similarly, Flores and Colleagues¹² had successfully treated acute bilateral EPN using only medical therapy. We also cured 15 patients using only medical therapy without resorting to surgery. We treated all of our patients with parenteral ceftriaxone and metronidazole. However, together with broad spectrum antibiotics, percutaneous drainage is the most frequently applied treatment modality of EPN. Percutaneous drainage is thought to decrease the burden of infection and spread of infection into surrounding tissues.¹³

CONCLUSION:

EPN is a rare fatal disease, which requires early diagnosis and initiation of treatment. The most controversial point of this pathological entity is its management. A variety of prognostic factors

were specified to determine the appropriate treatment approach of EPN. We think that nephrectomy is an important treatment modality, but there is a trend to maintain conservative treatment regimens by percutaneous techniques. The important clinical issue is to determine the best treatment for each patient.

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