

# Double J stenting: A rewarding option in the management of emphysematous pyelonephritis

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## Abstract

**Context:** Emphysematous pyelonephritis (EPN) is an acute necrotizing inflammation of renal parenchyma and peri-nephric tissue characterized by gas formation. In this study, we evaluated the outcome of EPN cases by medical management with or without renal decompression.

**Materials and Methods:** We have observed prospectively 15 cases of EPN admitted in our institute in respect to age, sex, mode of presentation, presence of comorbidity, laboratory profile, urine-analysis, and outcome after medical management and drainage procedures.

**Results:** All patients improved on medical management and drainage procedure such as JJ stenting and percutaneous nephrostomy. No mortality noted in our 15 cases of EPN.

**Conclusion:** Emphysematous pyelonephritis can be managed conservatively by DJ stenting, which is a less morbid procedure or percutaneous nephrostomy with proper antibiotics and adequate glycemic control.

**Key Words:** Double J stent, emphysematous, pyelonephritis

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## INTRODUCTION

Emphysematous pyelonephritis (EPN) is an acute necrotizing parenchymal and peri-renal infection caused by gas-forming uropathogens.<sup>[1]</sup> It is considered as a urological emergency and needs early treatment to avoid high morbidity and mortality. It usually occurs in female<sup>[2,3]</sup> and diabetic patients.<sup>[3,4]</sup> It mostly affects the adult populations. The overall mortality rate ranges from 20 to 45 in the literature. Usual clinical presentations are flank pain, fever, and vomiting. Due to recent advances in diagnostic methods and healthcare infrastructures, early diagnosis of the case is possible with early treatment

and better outcome. Now, the strategy changes to renal conservative methods with renal preservation. In this series, we are presenting the 15 cases of EPN diagnosed on the basis of radiological evidences and aggressive management done by medical managements and drainage procedures which include JJ stenting and percutaneous nephrostomy (PCN). An excellent outcome was seen using this strategy.

## MATERIALS AND METHODS

We collected the cases from admissions in our Department of Urology and referred from other departments such as

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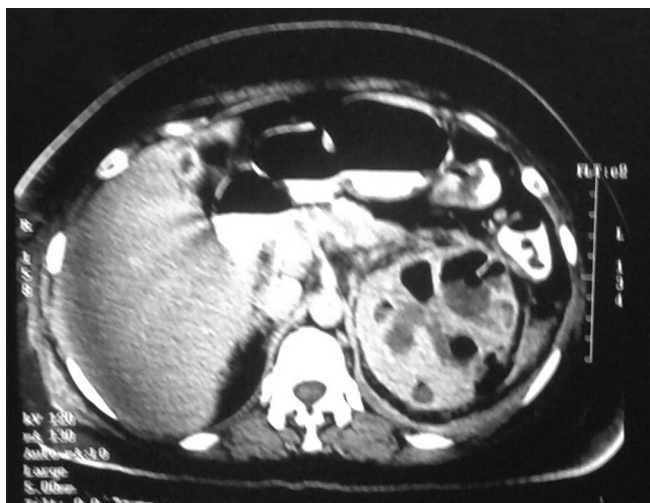
Nephrology or Internal Medicine. This is an observational prospective study conducted in the Department of Urology from August 2013 to August 2015.

For this study, only those cases were included who have radiological evidences of gases in renal parenchyma or in pelvicalyceal system [Figure 1], urinary bladder or in peri-nephric space.

Clinical profile, laboratory reports, microbiological study, and radiological study of all the patients were analyzed. All cases were managed aggressively by broad spectrum antibiotics (started empirically), glycemic control (target blood sugar is below 200 mg/dl), fluid and electrolyte management, and hemodialysis, if required. JJ stenting [Figure 2] and PCN decided by the response of conservative measures and stage of the disease as mentioned by Huang and Tseng,<sup>[5]</sup> but that was not delayed beyond 48 h. All cases are followed up for 2 months.

## RESULTS

A total of 15 cases of EPN were included over 2-year period. Eleven were female and 4 were male patients [Table I]. Age of the patients vary from 40 to 70 years (mean age is 55.66 years). Twelve patients were known diabetics (80%), and among diabetics, 3 had chronic kidney disease also. One patient was known stone disease which was stented and later on improved clinically by undergoing open ureterolithotomy. All 15 cases [Table 2] were having fever at presentation (100%) and 10 patients had loin pain (66%). Ten patients had tender renal angle (66%) and 6 had palpable renal lump (40%). One patient was in shock and altered sensorium at the time of presentation. Among 15 cases, 11 had left-sided disease (74%) and 4 (26%) had right-sided



**Figure 1:** Computed tomography scan showing left side Grade 3 emphysematous pyelonephritis

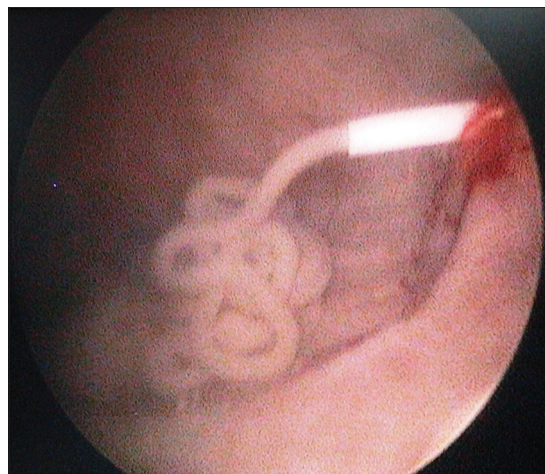
disease. According to computed tomography (CT) features, all patients were classified according to Huang and Tseng classification.<sup>[5]</sup> Three patients were in Class IIIB, 2 were in Class IIIA, 7 cases were in Class II, and 3 patients belonged to Class I. On blood examination, all patients have raised total leukocyte counts (18,000–25,000), two patients had thrombocytopenia (<40,000), and three patients had deranged renal function tests. On urine analysis, *Escherichia coli* isolated in eight patients (54%), *Klebsiella* in two patients, and *Pseudomonas* in one patient. Four cases had sterile urine. All patients are managed initially by aggressive medical therapy including broad spectrum antibiotic, glycemic control, fluid, and electrolyte management. Ten patients had undergone drainage procedures, among which 7 (46.6%) by JJ stenting and 4 (26.6%) by PCN. Rest 4 patients improved by only medical managements. All cases recovered well and discharged. The patients were followed up for 2 months. During the follow-up, all patients recovered well with respect to symptom improvement and renal function.

## DISCUSSION

EPN is an acute necrotizing infection of the renal parenchyma or urinary system caused by gas-forming organisms such as *E. coli* and *Klebsiella*.<sup>[5]</sup> The first case of EPN was reported by Kelly and MacCullem in 1898.<sup>[6]</sup> The term of “EPN” was coined by Schultz and Klorfein in 1962.<sup>[7]</sup>

EPN is commonly seen in diabetics and immunocompromised patients, with other risk factors such as intravenous drug users, neurogenic bladder, alcoholics, malnutrition cases, and in patients having some anatomical abnormalities in the urinary tract. However, diabetes is the single most predisposing factor. Nowadays, HIV infection is also emerging as a risk factor.<sup>[8]</sup>

The most common causative organism is *E. coli*.<sup>[9]</sup> The other organisms are *Klebsiella*, proteus, coagulase negative



**Figure 2:** Cystoscopy showing pus coming out through the DJ stent

**Table 1: Patient profile, management and outcome**

Age (years)/sex	Co-morbidity	Huang grade	Urine CS	Antibiotics used/duration	Procedure	Outcome
46/female	DM	2	<i>E. coli</i>	Pipzo/10 days	DJ stenting	Recovered
60/female	DM	1	<i>E. coli</i>	Do	Medical management	Do
52/male	DM	3A	<i>E. coli</i>	Do	PCN	Do
70/female	DM/CKD	2	Sterile	Do	DJ stenting	Do
48/male	No	1	Sterile	Do	Medical management	Do
56/female	DM/CKD	3B	<i>E. coli</i>	Do	PCN	Do
65/male	No	3A	<i>Klebsiella</i>	Do	PCN	Do
54/female	DM	2	<i>E. coli</i>	Do	DJ stenting	Do
76/male	DM	2	<i>Pseudomonas</i>	Do	DJ stenting	Do
57/female	DM	3B	<i>E. coli</i>	Do	PCN	Do
61/female	DM/CKD	2	<i>E. coli</i>	Do	DJ stenting	Do
58/female	No	1	<i>Klebsiella</i>	Do	Medical management	Do
47/female	DM/upper ureteric calculus	2	<i>E. coli</i>	Do	DJ stenting followed by open ureterolithotomy later-on	Do
40/female	DM	3A	Sterile	Do	Medical management	Do
45/female	DM	2	Sterile	Do	DJ stenting	Do

DM: Diabetes mellitus, CKD: Chronic kidney disease, PCN: Percutaneous nephrostomy, *E. coli*: *Escherichia coli*, CS: Culture and sensitivity

**Table 2: Clinical features at presentation**

Clinical features	n (%)
Sex	
Male	4 (26.7)
Female	11 (73.3)
Clinical presentation	
Fever	15 (100)
Flank pain	10 (66.7)
Vague abdominal	
Discomfort	4 (26.7)
Nausea and vomiting	8 (53.3)
Luts	3 (20.0)
Signs	
Renal angle	
Tenderness	10 (66.7)
Abdominal lump	6 (40.0)
Hypotension	1 (6.7)
Altered sensorium	1 (6.7)

*Staphylococcus aureus*, and some anaerobes such as *Clostridium septicum*.<sup>[9]</sup>

Pathogenesis is not still clear, but it is proposed that high tissue level of glucose with impaired blood supply facilitates the process of anaerobic metabolism of glucose and lactate by the microorganisms, leading to the production of gases such as carbon dioxide, nitrogen, hydrogen, oxygen, and methane. Thus, the factors involved in pathogenesis include high level of glucose within the tissues, the presence of gas-forming micro-organisms, impaired vascular supply, reduced host immunity, and the presence of an obstruction within the urinary tract.

Clinical presentation of EPN is similar to pyelonephritis such as fever, dysuria, nausea/vomiting, and flank pain. Fever is present in more than 80% of cases of EPN. On examination, loin tenderness is the common finding. Some cases may have palpable crepts in loin due to peri-nephric gas collection.

Laboratory findings include leukocytosis, azotemia, and hyperglycemia. Urine-analysis show pyuria and hematuria.

For diagnosis of the case, radiological evidence of gas is needed. Plain X-ray kidney ureter bladder may reveal mottled gas in renal area or crescent-like gas pattern in case of peri-nephric gas collection. Ultrasonography reveals strong focal echoes in the renal area. Interpretation of X-ray and ultrasonography for gas is difficult in obese patients and in the presence of bowel gases. CT scan or magnetic resonance imaging are the best modalities of choice for diagnosis.

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 Pfister suggested a classification on the basis of abdominal X-ray and an intravenous pyelography,<sup>[10]</sup> which was later modified by Michaeli *et al.*<sup>[11]</sup> They classified EPN into three classes:

- Class I: Gas in renal parenchyma or peri-nephric tissue
- Class II: Gas in the kidney and its surroundings
- Class III: Extension of gas through fascia or bilateral disease.

Wan *et al.*<sup>[1]</sup> classified the gas collection as Type I or Type II, on the basis of CT scans.

- Type I: Renal necrosis with the presence of gas, but no fluid
- Type II: Parenchymal gas associated with fluid in renal parenchyma, peri-nephric space, or collecting system.

Mortality was 69% in patients with Type I EPN and only 18% in patients with Type II EPN. Similar mortality rates for Type I and Type II EPN were observed by Chen *et al.* Huang and Tseng<sup>[5]</sup> 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 peri-nephric space
- Class IIIB: Extension of gas into pararenal space
- Class IV: EPN in solitary kidney, or bilateral disease.

The classification by Huang and Tseng<sup>[5]</sup> is 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.

Diagnosis of EPN is done by high clinical suspicion in cases of acute pyelonephritis and confirmed by radiological evidence of gas in renal parenchyma or collecting system or peri-nephric space.

Management includes medical management and drainage procedures. Medical management includes early use of broad-spectrum antibiotics empirically. Once the culture report is available, the antibiotics can be changed accordingly to glycemic control with insulin, correction of fluid and electrolyte imbalance, hemodialysis (if required). Drainage procedures are PCN and JJ stenting. There are several reports showing better outcome by conservative managements.<sup>[12,13]</sup>

The presence of bilateral disease, uncontrolled diabetes, thrombocytopenia, hypotension, altered sensorium, and impaired renal function are predictors of poor outcome and carry poor prognosis.

In our study, aggressive medical management was started and drainage procedure, if required, was done within 48 h. We prefer JJ stenting as the choice of drainage procedures as it can be done endoscopically and also less morbidity for the patients.

None of the patients in our series had >2 risk factors, thus necessity of emergent nephrectomy was not there. There was no Class IV EPN in our series.

## CONCLUSION

Medical management and drainage procedure are sufficient for the management of EPN cases. Currently, the role of nephrectomy in EPN is minimal. Among the drainage procedure, JJ stenting in our study showed a good outcome. PCN was done in selected cases. As JJ stenting can be done under local anesthesia and has less morbidity for the patient without the need for extra care, it was preferred over PCN. All patients in our study recovered well with medical management and drainage procedures. A combined team approach by a nephrologist, urologist, endocrinologist, and radiologist may be adopted for better outcome of this condition.

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## Conflicts of interest

There are no conflicts of interest.

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