

ORIGINAL ARTICLE

CONSERVATIVE MANAGEMENT OF EMPHYSEMATOUS PYELONEPHRITIS: THE SHIFTING TREND

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Background: Emphysematous pyelonephritis (EPN) is a potentially life threatening necrotizing pyelonephritis due to gas producing organisms. The objective of this study was to see the prognosis of patients of emphysematous pyelonephritis on conservative management. **Methods:** A Prospective Case series study was conducted at tertiary care hospitals of Army, Rawalpindi from Jan 2011 to Nov 2015. A total of 12 patients were evaluated in the study. All patients were managed conservatively and had hospital stay of maximum 3 weeks. **Results:** Of the 12 diagnosed diabetic patients (8 females and 4 males) 1 was class I emphysematous pyelonephritis, 4 were class II, 5 of class III a, 1 class III b and 1 case was of class IV. Fever and flank tenderness were the commonest presenting symptoms. All had positive renal punch and impaired renal functions. Four patients had thrombocytopenia and one patient presenting in shock died within 48 hours. All patients were initially managed with a protocol of aggressive fluid resuscitation, strict blood sugar control and broad spectrum antibiotics. Ultrasound guided percutaneous nephrostomy was done in seven patients for drainage. All patients responded well to conservative management except one needing nephrectomy. **Conclusion:**

Keywords: conservative, emphysematous, management, percutaneous nephrostomy, pyelonephritis

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INTRODUCTION

Emphysematous pyelonephritis (EPN) is a potentially life threatening necrotizing pyelonephritis due to gas producing organisms (commonly gram negative bacilli, especially *E. coli*, *Proteus*, *Pseudomonas*, *Enterobacter* and *Klebsiella*). It is seen in elderly diabetics with poor control and commonly associated with ureteric obstruction. Gas is formed in the kidney, perinephric space and collecting system. Computerized tomogram of kidney-ureter-bladder (KUB) is gold standard for diagnosis.¹ The common features of the disease are high grade fever, leukocytosis, parenchymal necrosis with exudative material and accumulation of fermentation gases within the dilated renal collecting system. Till late 1980s the standard treatment was nephrectomy because preserving the kidney led to significant mortality. This situation has improved over the past few years with early CT-scan and advances in the care of sepsis and multi organ dysfunction. In the recent years there are reports of improvement in renal functions after medical therapy and relief of obstruction by stenting or drainage, but many of the patients still require nephrectomy.^{2,3} The objective of this study was to assess the response of cases of EPN to stepped up medical treatment.

PATIENTS AND METHODS

A prospective case series was conducted. We prospectively studied these 12 patients with emphysematous pyelonephritis who presented to tertiary care hospitals of Army from Jan 2011 to Nov 2015, for clinical and laboratory profile and clinical outcome. All

were known cases of diabetes, and emphysematous pyelonephritis was identified on CT-scan. All patients of end stage renal disease on haemodialysis were excluded from the study. However there were no comparative controls. Patient demographics, clinical presentations, laboratory and Contrast Enhanced Computer Tomography of kidneys, ureters and urinary bladder (CECT-KUB) findings were recorded. Data were analyzed using SPSS-22. Descriptive statistics, i.e., Mean±SD was calculated for numerical values like age, while frequencies and percentages were calculated for categorical variables like gender and about various clinical presentations.

RESULTS

Out of the 12 patients with EPN, eight were females (M:F=4:8). Age range was 45-68 years with a mean age of 57 years. Of the 12 patients one was class I EPN, 4 were class II, 5 of class III a, 1 class III b and 1 case was of class IV. Fever and flank tenderness were the commonest presenting symptoms. Renal punch was positive in all the patients. All patients were known case of diabetes, however uncontrolled and females outnumbered males (Table-1).

All had impaired renal functions. Four patients had thrombocytopenia and one patient presented in shock. They were initially managed with a protocol of aggressive fluid resuscitation, strict control of blood sugar and broad spectrum antibiotics. Percutaneous drainage (PCN) under ultrasound guidance was done in seven patients (Table-2).

One patient who presented with shock died within 48 hours of presentation due to overwhelming sepsis. All other responded well to conservative management and only one underwent nephrectomy.

Table-1: Clinical features at presentation

| Parameters | Number | Percentage |
|----------------------------------|--------|------------|
| SEX | | |
| Male | 4 | 33 |
| Female | 8 | 67 |
| CLINICAL PRESENTATION | | |
| Fever | 12 | 100 |
| Flank pain | 11 | 91 |
| Vague abdominal discomfort | 1 | 8 |
| Nausea and vomiting | 6 | 50 |
| Dysuria and frequency | 4 | 33 |
| Depressed level of consciousness | None | None |
| Pneumaturia | None | None |
| SIGNS | | |
| Renal angle tenderness | 11 | 91 |
| Abdominal tenderness | 1 | 8 |
| Hypotension | 1 | 8 |
| Crepitus | None | None |

Table-2: Incidence of different classes of EPN and their outcome

| EPN Type | Patients | Incidence (%) | Management Outcome | |
|----------|----------|---------------|--------------------|-----------------|
| | | | Conservative | Invasive |
| Class 1 | 1 | 8.3 | 1 | No PCN |
| Class 2 | 4 | 33.3 | 1 | PCN-3 patients |
| Class 3a | 5 | 33.3 | 1 | PCN- 4 patients |
| Class 3b | 1 | 8.3 | 0 | Nephrectomy |
| Class 4 | 1 | 8.3 | | Died |

DISCUSSION

Emphysematous pyelonephritis (EPN) is a life-threatening necrotizing renal parenchymal infection due to intra-parenchymal gas.⁴ Emphysematous pyelonephritis (EPN) presents with pneumaturia and was first explained by Kelly and MacCullum who reported the first case of a gas-forming kidney infection.⁵ It occurs in diabetic patients.⁶ Predisposing factors include uncontrolled diabetes, renal tract obstruction including renal or ureteric calculi. *Escherichia coli* is the most common pathogen followed by *Klebsiella pneumoniae* and *Proteus*.⁶ These organisms ferment sugars in the urine and produce gases including nitrogen, carbon dioxide, hydrogen and oxygen.⁷

The risk of EPN is highest in female diabetics as they have an increased incidence of asymptomatic bacteriuria compared with non-diabetic.^{8,9} Most of our patients were middle-aged females with poorly controlled diabetes. Non-diabetic patients presenting with EPN usually have a higher rate of obstructive uropathy.¹⁰⁻¹² The CT classification of EPN is described by Huang *et al*⁶, and includes minor changes from the older proposed classification by Michaeli *et al*¹³. It basically gives the anatomical location of gas on CT scan:

- **Class 1** –Gas confined to the collecting system
- **Class 2** –Gas confined to the renal parenchyma alone
- **Class 3a** –Perinephric extension of gas or abscess
- **Class 3b** –Extension of gas beyond the Gerota fascia
- **Class 4** –Bilateral EPN or unilateral EPN with a solitary kidney

Surgery is accepted as the treatment of first choice in most patients with EPN.⁷ When treated with antibiotics alone, EPN is known to bear a high mortality rate (40%).⁸ Huang *et al* found that Class 1 and 2 EPN can be treated with percutaneous drainage and antibiotics.⁶ In class 3 and class 4, the presence of less than two risk factors (thrombocytopenia, acute renal failure, altered conscious level and shock) indicated that percutaneous drainage and antibiotics was a viable option (successful in less than 64% of cases). However, with three or more of the risk factors, nephrectomy offered better results. Mortality rates were 15–20% in two other case series with nephrectomy being the treatment of choice.^{2,9} Majority of Class 2 and 3a had to succumb to PCN along with broad spectrum antibiotics. One case had to undergo nephrectomy (Class 3b) and one presenting with shock (Class 4) died due to overwhelming urosepsis. Summarizing the outcome in our series it could be observed that severity and grade of EPN was a major indicator of invasive management.

Misgar *et al* studied 26 patients of EPN and found DM as the main risk factor. Most were males and those who had more than two risk factors developed extensive EPN (class 3 or 4). Majority (88.5%) of cases were treated successfully with conservative treatment.¹⁴ Sharma *et al* found successful conservative treatment in 14 patients of EPN. All cases had history of fever, 43% had had flank pain and 36% had abdominal discomfort. Renal angle tenderness was the commonest finding, found in 86% of the cases. *E. coli* was the commonest organism.¹⁵ In our series fever, flank pain and renal angle tenderness was present in almost all cases.

Falagas *et al*, demonstrated risk factors for mortality in 175 patients with emphysematous pyelonephritis where thrombocytopenia was associated with increased mortality. Systolic blood pressure less than 90 mm Hg, serum creatinine >2.5 mg/dl and altered level of consciousness were also shown to be associated with raised mortality. In that study the mortality rate was 25%.¹⁰ In our study impaired renal functions and thrombocytopenia were found to be associated with high grade EPN. The patient who died presented with septic shock and impaired renal functions however she did not have altered sensorium.

A retrospective study by Jha *et al*, on 22 patients found it exclusively in diabetic females. Conservative treatment was successful in 86% of the cases. Mortality was higher with high CT grade (III and IV), altered level of consciousness and thrombocytopenia.³ Ali *et al*¹⁶, also showed

uncontrolled diabetes in females as the major risk factor and the main pathogenic organism being *E. coli*.

The current study found that female diabetics were the more effected group. Conservative treatment was the mainstay of treatment, even in patients who would have undergone nephrectomy in 1980s. Judicious and timely use of appropriate antibiotics would in most cases give excellent results. CT scan use as the immediate diagnostic tool would diagnose much more number of patients leading to even better outcomes in the final management of these patients.

CONCLUSION

In this series of patients with EPN, all had DM, majority were women. Seventy-five percent of our patients had Class 2 and 3a EPN. Despite the presence of two or more bad prognostic factors and extensive EPN (class 3a, 3b or 4) in a majority of our patients, non-operative treatment afforded a striking success rate of 83% with only one patient requiring nephrectomy while the other dying of overwhelming sepsis. We propose an early aggressive medical treatment and recommend that nephrectomy is indicated only if patient does not improve or deteriorates on conservative management.

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