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(CASE REPORT)

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Importance of surgical intervention in emphysematous pyelonephritis: A case report

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Abstract

Emphysematous pyelonephritis (EPN) is a rare necrotizing infection characterized by gas formation within or around the renal parenchyma. Clinical presentations include fever, abdominal pain, vomiting, septic shock, altered sensorium, and acute kidney injury. Uncontrolled diabetes and urinary tract obstruction are the most common risk factors, especially in women. Escherichia coli and Klebsiella Pneumoniae are frequently involved pathogens. The diagnosis is usually based upon computed tomography that shows gas patterns in renal parenchyma. Treatment modalities include conservative management with broad-spectrum antibiotics, glycemic control, prompt fluid resuscitation, and surgical intervention such as percutaneous drainage, double J stenting, and nephrectomy. The objective of this case report is to present a 72-year-old female patient with uncontrolled type-2 diabetes and recurrent urinary tract infection who was hospitalized with complaints of altered sensorium, hypoglycemia, hyperpyrexia, excessive vomiting, abdominal pain, and severe sepsis. The diagnosis was based upon computed tomography scan that showed an enlarged left kidney with gas patterns in the renal parenchyma, confirming emphysematous pyelonephritis. Surgical intervention was suggested by the urologist; instead conservative management was employed for the patient due to financial burden. The expected outcome was not achieved with conservative approach and the importance of surgical intervention was observed.

Keywords: Cystitis; Diabetes Mellitus; Nephrectomy; Pyelonephritis; Surgical excision

1. Introduction

Emphysematous pyelonephritis (EPN) is a severe necrotizing infection of renal parenchyma and surrounding tissues, leading to gas accumulation. It was first described in 1898 by H.A. Kelly and W.G. MacCallum [1]. and the term 'emphysematous pyelonephritis' was suggested by Schultz and Klorfein in 1962 [2]. *Escherichia coli (E. coli), Klebsiella Pneumoniae (K pneumoniae), Clostridium, Candida, Aspergillus, Cryptococcus, and Amoeba* are the most involved common pathogens [3]. Patients with diabetes mellitus and urinary tract obstruction who are infected with *E. Coli* and *K. pneumonia* can predominantly develop EPN, especially people with poor glycemic control act as hosts for the gas-forming microorganisms through mixed acid fermentation of glucose [4]. EPN is predominantly seen in women than men (3:1) [5]. The classification of EPN is mainly based on radiological findings. Several methods of classification were introduced for both plain radiography and computed tomography (CT). A more detailed CT classification was given by Huang and Tseng that include 4 distinct classes (Table 1) [4]. Acute pyelonephritis and EPN show similar clinical manifestations including fever, abdominal or flank pain, nausea, vomiting, altered sensorium, shock, acute renal impairment. Positive blood culture, infective urine, pyuria, elevated creatinine levels are the differential diagnostic features. Confirmatory diagnosis can be established by a CT scan that depicts gas patterns. The clinical approach

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comprises conservative management by utilization of systemic antibiotics, prompt hydration, and relief of obstruction with percutaneous drainage (PCD), stenting, rapid glycemic control. Surgical intervention like nephrectomy is usually adopted in extensive disease. We report a case of left-sided emphysematous pyelonephritis with cystitis.

Table 1 Haung-Tseng classification of emphysematous pyelonephritis [4]

Class	Description
Class I	Gas in the collecting system only
Class II	Gas in renal parenchyma only
Class III a	Extension of gas or abscess to perinephric space
Class III b	Extension of gas or abscess to pararenal space
Class IV	Bilateral emphysematous pyelonephritis or solitary kidney with emphysematous pyelonephritis

2. Case Report

A 72-year-old female patient was admitted to a tertiary care hospital with complaints of high-grade fever, excessive vomiting (4-5 episodes/day) abdominal pain for a week. She also had occasional burning micturition, slurred speech, and altered sensorium. She was a known case of type 2 diabetes mellitus for 15 years and on regular oral anti-diabetic treatment with a fixed-dose combination of Metformin 500 mg and Glimepiride 2 mg, twice daily. The baseline vital signs were: temperature 102 °F, heart rate 98 bpm, blood pressure 130/80 mmHg, respiration rate 20 cycles per minute, and Spo2 92% at room air. Clinical examination exhibited facial and bilateral pedal edema and systemic examination was normal. Elevated HbA1c of 14.9% revealed poor glycemic control. Haematological findings included decreased haemoglobin (8.7 mg/dL), packed cell volume (27%), increased leukocytes (20.0 x 10^9/L) and neutrophils (85%). Peripheral smear suggested dimorphic anemia and toxic neutrophilic leukocytosis with left shift. Blood culture isolated Klebsiella Pneumoniae (gram-negative bacilli). Renal function tests revealed elevated urea (156 mg/dL) and serum creatinine (5 mg/dL). Based upon the creatinine level, the estimated glomerular filtration rate was 9 ml/min/1.73m^2. The urine examination showed plenty of pus cells with budding yeast. Plain CT abdomen impressions included enlarged left kidney measuring about 11x6.2x5.2 cm (Figure 1) with notable multiple pockets of air and significant perinephric fat stranding (Figure 2) suggesting emphysematous pyelonephritis with cystitis. Clinical management was conservative that consisted of systemic antibiotics Piperacillin-Tazobactam (6.75 gm/day) for a week, then switched to Meropenem (1000 mg/day), followed by fluid resuscitation along with supportive therapy. Glycemic control was achieved by short-acting insulin (Human insulin 40IU). The expected outcome was not achieved as the patient refused Double J (DJ) stenting and PCD, therefore conservative management was continued.

Figure 1 Non-contrast Plain CT (coronal view) showing enlarged left kidney about 11x6.2x5.2 cm (red square mark)

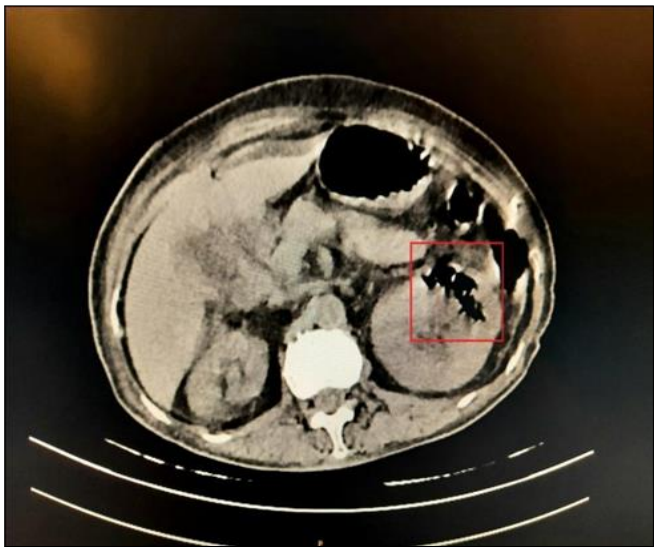

Figure 2 Non-contrast Plain CT scan (axial view) showing gas accumulation in renal parenchyma (red square mark)

3. Discussion

Emphysematous pyelonephritis is a rare infection characterized by the accumulation of gas in renal parenchyma. About 95% of cases are associated with uncontrolled diabetes [6]. The mortality rate is higher (80%) in EPN involving perinephric space compared to localized gas accumulation in renal parenchyma (60%) [7]. Literature suggests that the mortality rate is 36.7% in patients with chronic kidney disease and severe sepsis [8], thus a significant improvement could not be achieved solely with conservative management. In the presenting case, the patient was suffering from end-stage renal disease (ESRD) with creatinine clearance of 9 ml/min/1.73m^2 and severe sepsis associated with poor glycemic control. Uncontrolled diabetes and associated cystitis could be the predisposing factors that lead to EPN. Albeit, she refused hemodialysis and renal replacement therapy, due to her lower socioeconomic background which led to an uncertain prognosis. Based upon the CT finding and Huang-Tseng classification, the condition was diagnosed as IIIA EPN. DJ stenting was advised by consulting urologist, although it was not performed since it was unaffordable to the patient.

The management of EPN is basically approached by conservative therapy and surgical intervention. Fluid resuscitation, glycemic control, empirical intravenous antibiotics are the mainstay of the conservative treatment. As per a retrospective study, conservative therapy is beneficial in achieving better outcomes and should be considered as first-line therapy [9]. Isolates of blood and urine culture usually consist of gram-negative bacilli, for which aminoglycosides are widely recommended. It should be cautiously used in patients with deranged renal function. In this instance, aminoglycoside was disregarded as the patient had ESRD. Initially, broad-spectrum Piperacillin-Tazobactam was used, later switched to Meropenem due to poor response.

Risk factors like thrombocytopenia, acute renal failure, altered sensorium, severe sepsis, and conservative treatment are the causes of mortality [10]. While conservative management is considered as one of the risk factors, surgical intervention may be preferred. Specifically, PCD is found to be more effective than other invasive interventions [11]. Despite the emergence of the surgical approach in our case, the patient's unwillingness made us choose therapeutic management. Subsequently, it complicated the disease condition which led to readmission after 2 months. Therefore, combined therapeutic and surgical measures in extensive EPN will be effective.

4. Conclusion

The importance of surgical intervention was observed in the present case. Conservative management alone was not impactful in improving the overall quality of life. Growing incidence of diabetes mellitus in the Indian population, especially in women with urinary tract infection are at risk of developing EPN, therefore frequent screening is essential. Introducing subsidies for surgical procedures in EPN management would benefit patients from lower socioeconomic backgrounds.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest.

Statement of informed consent

Informed consent was obtained from the participant included in the study.

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