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Case Report

Bilateral emphysematous pyelonephritis cured by antibiotics alone in a black African woman☆

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ABSTRACT

A 78-year-old black woman with a 10-year history of diabetes mellitus was admitted to the intensive care unit. Upon admission, she presented with chills, nausea, and left flank pain. The presence of hyperglycemia (fasting blood glucose, 19.7 mmol/L) and an altered consciousness required immediate treatment with insulin analog. Laboratory investigations and enhanced computed tomography scan led to the diagnosis of bilateral emphysematous pyelonephritis (EPN). The patient responded well to conservative treatment with antibiotics, and was finally discharged after 22 days when the computed tomography scan showed resolution of all the pockets of air. This case and associated literature review of 25 previously reported cases of bilateral EPN show the changing trend of EPN management from emergency nephrectomy toward conservative treatment with potent antibiotics and/or percutaneous drainage, and has been associated with higher survival rates compared to emergency nephrectomy.

Introduction

Emphysematous pyelonephritis is a rare acute necrotizing infection affecting the renal parenchyma, the collecting system, and peri-renal tissue, which is potentially life threatening and it is identified by the presence of gas within these structures [1–5]. The first case of emphysematous pyelonephritis was reported by Kelly and McCallum in 1898 [6], and since then "Pneumonephritis," "renal emphysema," and emphysematous pyelonephritis are eponyms that have been used to describe the condition [7]. Poorly regulated blood sugars (diabetes) and obstruction in the urinary tract are the major predisposing factors of emphysematous pyelonephritis, observed in approximately 90% and 20% of the cases respectively [8–10]. *Escherichia coli* is the most encountered organism in

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emphysematous pyelonephritis cases, accounting for 60%-70% of cases. Other gas forming organisms implicated in emphysematous pyelonephritis include *Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Aerobacter aerogenes, Citrobacter*, and rarely yeast [1–12].

Emphysematous pyelonephritis is commonly seen in women, frequently involving the left kidney, with fewer cases (5%-10%) involving both kidneys (bilateral) [5,13]. Bilateral emphysematous pyelonephritis is extremely rare, accounting for approximately 10% of emphysematous pyelonephritis cases, and is often associated with increased risk of multiorgan dysfunction, sepsis, longstanding hemodialysis and hence higher mortality rate [4,5,14].

Emphysematous pyelonephritis has been known to be a rare disease, however, there has been an increase in the number of emphysematous pyelonephritis cases diagnosed over the years due to increasing use of computed tomography and increasing prevalence of metabolic syndrome and diabetes. Management options for emphysematous pyelonephritis ranges from conservative approach including antibiotics treatment, vigorous resuscitation, blood sugar control to percutaneous drainage (PCD) and nephrectomy [1,5].

In this study, we present an additional case of bilateral emphysematous pyelonephritis in a black African woman, who was treated successfully with antibiotics alone, which is one of the first cases reported in Ghana and Africa as a whole, and a review of 25 reported cases of bilateral emphysematous pyelonephritis with emphasis on management options and outcomes.

Case report

A 78-year-old black woman had a 10-year history of diabetes mellitus (DM; Type 2). A background history of poor compliance with medication was noted. Upon admission, she presented with fever, chills, nausea, and complained of pain at the left lumbar region (left-sided flank pain) which was relieved after urination. On further examination, there was evidence of visible weight loss with generalized weakness with altered consciousness but her hydration status was satisfactory. Her blood pressure was 110/60 mmHg; and pulse, 79 bpm with normal sinus rhythm.

Laboratory investigations revealed a white blood cell count of 5.1×10^9/L; platelets, 342×10^9/L; red blood cell count, 3.64×10^{12}/L; hemoglobin, 10.4 g/dL and hyperglycemia (fasting blood glucose, 19.7 mmol/L) was present. The red blood cells were normal, and the platelets and white blood cells showed normal morphology and distribution. Acute renal impairment was noted, with serum creatinine, 1.7 mg/dL (reference range: 0.9-1.3 mg/dL) and blood urea 30 mg/dL (reference range: 7-20 mg/dL). Urinalysis revealed pH at 5.0, proteinuria, and hematuria. The urine culture showed positive for *E coli*.

Enhanced computed tomography scan of the abdominal pelvis showed no evidence of obstruction. Pockets of air were noted within the dilated left pelvi-calyceal system with air fluid levels consistent with Type 1 left emphysematous pyelonephritis. Also, there was minimal loculi of air in the right pelvi-calyceal system consistent with Type 2 emphysematous pyelonephritis. Based on these findings, diagnosis of bilateral emphysematous pyelonephritis was confirmed.

On admission, she was treated intravenously with antibiotics (Meropenem (1 g twice daily) and Gentamicin (80 mg twice daily). The hyperglycemia was initially treated with insulin analog but was switched to oral medication with metformin when significant improvement in glycemic control was observed. She responded well to antibiotics and was discharged 22 days after her initial admission.

Enhanced CT scan before the patient was discharged showed resolution of all the pockets of air within the calyceal collections in the left kidney. There was a significant reduction in the size of these collections too, the largest one which measured approximately 7.4×5.3 cm now measured 5.2×3.6 cm. The small focus of air in the right kidney had completely resolved. Improved renal function was observed, with urea and creatinine levels reduced to 15 mg/dL and 1.1 mg/dL respectively.

Discussion

Emphysematous pyelonephritis is a potentially life threatening necrotizing infection that affects the renal parenchyma, the collecting system, and peri-renal tissue, and it is characterized by the presence of gas within these structures [1–5]. The pathogenesis of emphysematous pyelonephritis appears to involve 4 factors: high tissue glucose, gas-forming bacteria, a defective immune response, and impaired tissue perfusion [15]. Predisposing factors indicating poor prognosis include acute renal failure, shock, altered consciousness, and thrombocytopenia [16]. In our case, poor regulation of blood glucose (DM) was the only predisposing factor observed, as her fasting blood glucose on arrival was 19.7 mmol/L. This was most likely due to the noncompliance with her medication. This further reinforces the observation by several studies that DM is the most prevalent comorbidity in emphysematous pyelonephritis patients, with an incidence of about 85% [1,2]. This trend is observed because DM offers an ideal environment for developing emphysematous pyelonephritis; high glucose concentrations in tissues, impaired tissue perfusion, and the presence of gas-producing organism [17]. The glucose serves as a substrate for the gas-producing organism, which in turn produces carbon dioxide and hydrogen by fermentation [17]. It is thought that urinary albumin serves as a substitute for glucose in nonDM patients [17] but glucose is the preferred substrate by the gas-producing organisms, accounting for the high prevalence of emphysematous pyelonephritis cases in DM patients. The most common presenting symptom of emphysematous pyelonephritis reported in literature is fever followed by flank pain, with other symptoms including nausea, vomiting, altered consciousness, renal impairment, and shock reported by some studies [1,2]. Our patient presented with fever, nausea, flank pain (left side), and altered consciousness. *E coli* was the organism cultured from her urine sample. Several studies done in emphysematous pyelonephritis have also reported a 60%-70% prevalence of *E coli* [1–12].