Case Report
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Emphysematous Pyelonephritis with IgA-Dominant Infection-Related Glomerulonephritis: An Unusual Picture

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Abstract

Objective. The aim of this case report is to illustrate a very rare case of emphysematous pyelonephritis complicated by IgA-dominant postinfectious glomerulonephritis. **Case Report.** We report the case of a 53-year-old woman with emphysematous pyelonephritis who initially presented with unintentional weight loss for 3 months and subnephrotic range proteinuria without fever. Urinalysis revealed proteinuria, microscopic hematuria, and pyuria. A kidney biopsy was performed for suspected glomerulonephritis. The patient's right kidney biopsy was consistent with immunoglobulin A (IgA)-dominant infection-related glomerulonephritis. Abdominal computed tomography to seek the possible source of infection revealed staghorn stones obstructing dilated calyces and gas collection within the collecting system. The final diagnosis was emphysematous pyelonephritis of the left kidney complicated by IgA-dominant infection-related glomerulonephritis of the right kidney. **Conclusion.** We present an atypical presentation of emphysematous pyelonephritis in terms of clinical presentation (prolonged course of illness without fever) and its complications (IgA-dominant infection-related glomerulonephritis). This case study highlights the critical role of kidney biopsy in the diagnosis and the diverse clinical manifestations in clinical medicine.

Key Words: Unintentional Weight Loss ▪ Proteinuria ▪ Kidney Infection ▪ Biopsy ▪ Flank Pain.

Introduction

Emphysematous pyelonephritis (EPN) is a severe necrotizing kidney infection associated with gas formation. The typical clinical spectrum of EPN encompasses fever, flank pain, and, in severe cases, thrombocytopenia, renal dysfunction, and shock may occur (1-3). The symptom duration before diagnosis is usually <10 days (1); however, longer durations have been reported (4, 5).

We report the case of a 53-year-old woman with left EPN presenting with unintentional weight loss and subnephrotic range proteinuria without fever. To the best of our knowledge, this is the first reported case of EPN presenting with a prolonged course of illness without fever and complicated by immunoglobulin (Ig) A-dominant infection-related glomerulonephritis (IgADIRGN).

Case Report

A 53-year-old woman with non-contributory past medical history was referred to our hospital for malaise and unintentional weight loss of 23 kg in 3 months. She did not experience fever, night sweats, or other abnormal symptoms. Her vitals at the time of presentation were as follows: temperature, 36.5 °C; blood pressure, 111/77 mmHg; heart rate, 102 beats/min; respiratory rate, 20 breaths/min; and oxygenation level, 98%. No significant

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physical findings were observed. Hematuria, proteinuria, and elevated leukocyte levels were noted on urinalysis (Table 1). Bloodwork showed normal white blood cell counts [50% neutrophils, 38% lymphocytes, no band form, 31% hematocrit, and 331×10^3/μL platelet count]. Serum blood urea nitrogen, creatinine, fasting blood sugar, HbA1c, and 24-hour urine protein levels were 10 (reference: 9.8–20.1) mg/dL, 0.65 (reference: 0.73–1.18) mg/dL, 81 (reference: 70–100) mg/dL, 5.59% (4.5–6.3%), and 2,189 (reference: <150) mg/day, respectively. Chest radiography showed no abnormal findings, and urine and blood cultures were negative.

Table 1. Complete Laboratory Analysis

Analysis	Reference range	At		
		Presentation	Nephrectomy	Two weeks*
Blood				
BUN	8.9-20.6 mg/dL	10	11	12
Serum creatinine	0.73-1.18 mg/dL	0.65	0.59	0.47
eGFR(EPI)	ml/min/1.73^2	101.7	105	113
Na	136-145 mEq/L	137	132	131
K	3.5-5.1 mEq/L	3.74	3.61	4.97
Cl	98-107 mEq/L	102	98	98
HCO3	22-29 mEq/L	26	22	27
WBC	4.5-10.0×10^3/μL	5.3	7.09	8.6
Neutrophil	20-50%	50	70	69
Lymphocyte	20-40%	38	21	21
Hemoglobin	12.0-16.0 g/dL	10.0	9.9	11.4
Hematocrit	37-47%	31	30.1	34
Platelet	150-450×10^3/μL	331	435	498
TSH	0.35-4.94 uIU/mL	0.46	-	-
Morning cortisol	10-20 mcg/dL	13	-	-
AST	5-34 U/L	10	-	-
ALT	0-55 U/L	6	-	-
ALP	40-150 u/L	79	-	-
Total bilirubin	0.2-1.2 mg/dL	0.3	-	-
Fasting blood sugar	70-100 mg/dL	81	-	-
Hemoglobin A1C	4.5-6.3%	5.59	-	-
Anti-HIV	Negative	Negative	-	-
ANA	Negative	1:320	-	-
C3 complement	88-165 mg/dL	184	-	-
C4 complement	14-44 mg/dL	39.5	-	-
Urine				
Analysis	-	Color: Yellow, Specific gravity: 1.011, pH: 6.0, Protein: 2+, Glucose: negative, RBC >100/HPF, WBC: >100/HPF	-	-
24-hour protein	<150 mg/dL	2,189	1,072	256
Urine culture	-	Negative	-	-
Hemoculture	-	Negative	-	-

*After nephrectomy.

Kidney biopsy was performed due to the abnormal urine sediment and proteinuria. Preoperative ultrasonography revealed a calyceal stone in the left kidney; therefore, biopsy was performed on the right kidney. There were 17 glomeruli, including 1 with global sclerosis. Mild mesangial expansion and no endocapillary proliferation or exudative glomerulonephritis were noted. Immunofluorescence analysis showed 2+ C3 and 1+ IgA granular patterns at the mesangium. Staining was negative for IgG, IgM, C1q, kappa, lambda, and fibrinogen. Right kidney biopsy was consistent with IgADIRGN. Whole-abdominal computed tomography (CT) was performed to seek the possible source of infection, which revealed an enlarged left kidney, staghorn stone obstructing dilated calyces, and gas collection within the collecting system (Figure 1A). The right kidney was normal in size. Enhanced CT of the left kidney revealed EPN class 2 according to the Huang and Tseng Classification (1). The patient was treated with intravenous ceftriaxone (2 g once daily for 7 days), and percutaneous catheter drainage was attempted to relieve obstruction in the urinary tract, but it failed due to unsuitable anatomy. The patient denied double J stenting placement because she felt that her symptoms improved after antibiotic treatment. After 7 days of intravenous ceftriaxone administration, she was treated as an outpatient, and the antibiotic was changed to oral ciprofloxacin, which was prescribed for 2 months. Her condition improved gradually; her appetite had improved, and she had gained 8 kg at the 4-month follow-up. However, her proteinuria persisted. After discussion between the attending physicians (including nephrologist and urologist) and patient, left nephrectomy was performed at 6 months after the first admission without any complications.

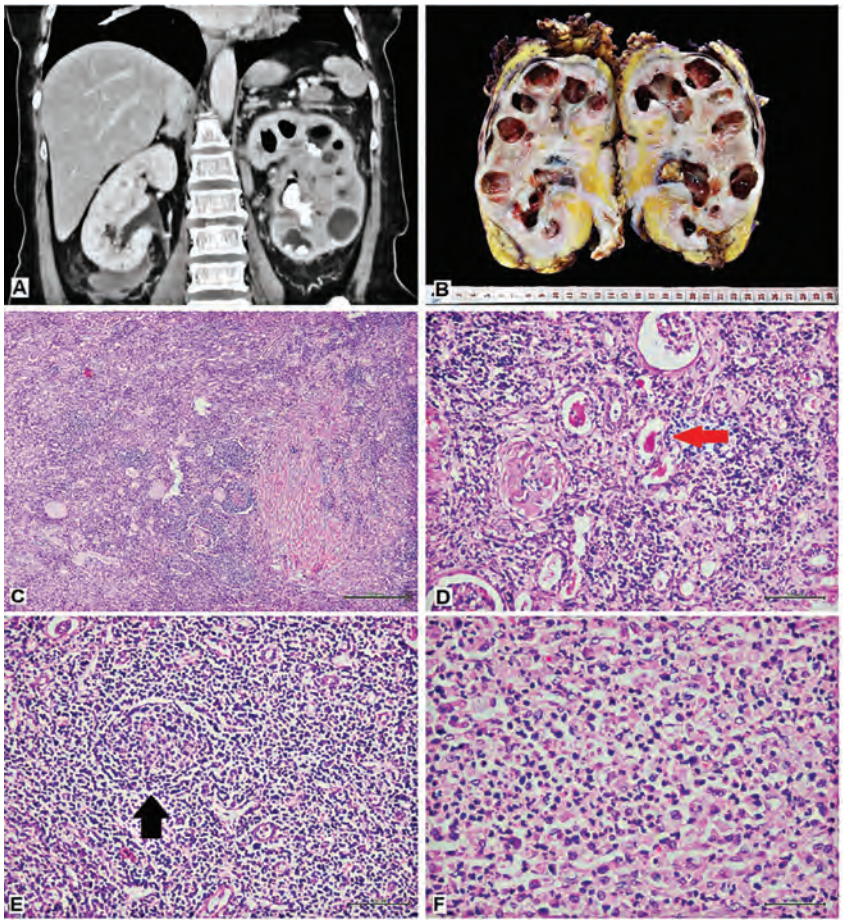

Figure 1. Coronal image of computed tomography, gross photograph of the kidney, and pathological finding. (A) Computed tomography of the abdomen shows an enlarged left kidney, multiple staghorn stones obstructing dilated calyces, and gas collection within the collecting system and renal parenchyma corresponding to class 2 (Huang and Tseng Classification) features. (B) Gross pathological analysis of the left kidney shows staghorn calculi, dilated calyces, and cystic cavities. (C) Microscopic examination reveals intense diffuse lymphoplasmacytic infiltration with interstitial fibrosis (hematoxylin and eosin staining, bar = 500 μm). (D & E) Tubular atrophy filled with colloid casts (red arrow) and germinal center (black arrow) are present (bar = 100 μm). (F) Focal abscessation and histiocytic infiltration are seen (bar = 50 μm).

Her 24-hour protein level reduced significantly 2 weeks following nephrectomy. Table 1 summarizes the patient's laboratory results during nephrectomy

and at the 2-week follow-up after nephrectomy. Light microscopy of the left kidney showed diffuse lymphoplasmacytic infiltration, interstitial fibrosis with focal abscessation, and histiocytic infiltration (Figure 1).

Discussion

We describe the case of a woman with EPN complicated by IgADIRGN who initially presented with unintentional weight loss and subnephrotic range proteinuria without fever. EPN and acute pyelonephritis have similar presenting symptoms; thus, making the diagnosis challenging. EPN symptoms rarely present without fever for >10 days before diagnosis (1). The unusual presenting symptoms complicated the diagnosis in our patient. Furthermore, our case highlights that CT provides greater accuracy in the diagnosis of EPN, as compared to ultrasonography. Renal ultrasound prior to renal biopsy showed nothing more than calyceal lithiasis with no signs of complication. Air-related lesion can be missed on ultrasonography in unsuspected cases.

The differential diagnoses were IgADIRGN and IgA nephropathy; however, a diagnosis of IgA nephropathy can only be established if immunofluorescence staining on kidney biopsy demonstrates dominant or co-dominant deposition of IgA nephropathy. Herein, kidney biopsy with immunofluorescence staining revealed a predominance of C3. The old-age onset, concurrent infection, and kidney pathology made a diagnosis of IgADIRGN more likely than one of IgA nephropathy; thus, no immunosuppressive agent or other treatments, apart from antibiotics, were prescribed. A potential cause of persistent post-renal proteinuria was EPN (same infection) or lithiasis that was resolved with nephrectomy. However, post-renal proteinuria is generally insignificant. Therefore, infection or lithiasis could not adequately explain the post-renal proteinuria in this case (2.1 g/day). After the diagnosis of IgADIRGN, infection as the cause of the patient's presenting symptoms was carefully investigated. IgADIRGN is a form of infection-related glomerulonephritis (6). It typically occurs in diabetic patients with staphylococcal infections (6) and can occur in nondiabetic patients with other pathogens (7). IgADIRN is being increasingly recognized and can present with multiple infection sites. It is imperative for caring physicians to be familiar with this entity.

Our patient had EPN complicated by IgADIRGN, which, to the best of our knowledge, has not been previously reported. In a retrospective study by John et al., urinary tract infection was the leading cause of parainfectious glomerulonephritis; however, they did not investigate infections of the upper or lower urinary tract or the severity of infection (8).

Limitation of Case Study

Study limitations include the lack of electron microscopy and no definitive diagnosis of IgADIRGN. The differential diagnoses of the right kidney pathology included IgADIRGN, IgA nephropathy, and C3 glomerulonephritis. The patient's concurrent infection, older age, and stronger staining for C3 than for IgA indicated that IgADIRGN was a more likely diagnosis (9). However, it is not always possible to distinguish these entities from each other even with the use of electron microscopy. Sometimes, it is not important to distinguish between secondary IgA nephropathy and IgADIRGN because both responded well to the treatment for the primary infection as in our case.

Conclusion

This case report described an unusual presentation of EPN, with a prolonged course of illness without fever. Moreover, IgADIRGN is an atypical complication of EPN that, to the best of our knowledge, has not been previously reported. Our report highlights the critical role of kidney biopsy in achieving accurate diagnosis and diverse clinical presentations in medicine.

What Is Already Known on This Topic:

Emphysematous pyelonephritis is a rare, life-threatening infection of the renal parenchyma that is associated with gas formation. Patients with

emphysematous pyelonephritis typically present with fever, flank pain, or septic shock in severe cases. A prolonged course of illness without fever prior to diagnosis is rare.

What This Case Adds:

This is believed to be the first reported case of emphysematous pyelonephritis presenting with a prolonged course of illness without fever and complicated by immunoglobulin A-dominant infection-related glomerulonephritis. This case study highlights the critical role of kidney biopsy in the diagnosis and the diverse clinical manifestations in clinical medicine.

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Consent to Publish Statement: Written informed consent was obtained from the patient for publication of this case report and all accompanying images.

Data Availability Statement: All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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