Case Report

Acute Kidney Injury with Characteristics of Rapidly Progressive Glomerulonephritis Due to Suspected IgA Nephropathy: A Case Report

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ABSTRACT

Acute kidney damage (AKI) in glomerular disease is typically characterized by rapidly progressive glomerulonephritis (RPGN). RPGN in IgA nephropathy is uncommon, occurring in less than 10% of patients. RPGN presents diagnostic issues in resource-limited settings. A 34-year-old male patient had acute kidney injury with RPGN characteristics based on clinical symptoms of hypertension, pitting edema, anuria, and hematuria after an upper respiratory tract infection, as well as laboratory findings of proteinuria, persistent microscopic hematuria, and positive erythrocyte casts. Serum creatinine levels rose sharply. Corticosteroids, antihypertensives, and hemodialysis resulted in clinical improvement and fast kidney function recovery. Due to limited resources, no kidney biopsy was conducted. This case provides a diagnostic approach to RPGN in IgA nephropathy in resource-limited settings, along with comprehensive therapy.

Keywords: RPGN, Rapidly Progressive Glomerulonephritis, IgA Nephropathy, Acute Kidney Injury, Case Report.

Introduction

Glomerulonephritis (GN) is a spectrum of illnesses caused by diverse immune responses and marked by inflammation in the kidney filtration units.[1] Immune complex glomerulonephritis (which includes infection-associated glomerulonephritis, IgA nephropathy, lupus nephritis, and cryoglobulinaemic glomerulonephritis), anti-neutrophil cytoplasmic antibody-associated glomerulonephritis (pauci-immune), anti-glomerular basement membrane glomerulonephritis, C3 glomerulopathy, and monoclonal immunoglobulin-associated glomerulonephritis are the four main types of glomerulonephritis.[2]

IgA nephropathy is the most prevalent primary glomerulonephritis globally.[3–5] Its prevalence varies among areas. Primary IgA nephropathy is the most common kind of primary glomerulopathy in adults, accounting for 2.5 occurrences per 100,000 persons worldwide each year. It is most prevalent in East Asia (45 cases per million people in Japan), Europe (31 cases per million in France), and Africa.[4,6] Some cases of IgA nephropathy have been documented in Indonesia, but no research has found a prevalence.

Glomerulonephritis is responsible for roughly 10% of acute kidney injury (AKI) cases in adults. AKI episodes in glomerular disorders

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are frequently triggered by Rapidly Progressive Glomerulonephritis (RPGN).[3] RPGN in IgA nephropathy occurs in less than 10% of patients.[7] RPGN is distinguished by a nephritic syndrome (hematuria, proteinuria, oliguria, edema, and hypertension) followed by a fast and progressive loss in kidney function over days or weeks, which can lead to end-stage renal failure if not treated rapidly.[8] Histopathologically, RPGN is distinguished by crescentic or crescent-shaped characteristics in some glomeruli.[9] RPGN results in nephritic urine examination, which includes proteinuria, microscopic or macroscopic hematuria, dysmorphic red blood cells, and red blood cell casts. The diagnosis is based on history, urinalysis, serologic testing, and a kidney biopsy. RPGN is a challenging diagnosis, particularly in resource-limited settings. Early diagnosis, adequate therapy, and evaluation are required to prevent a poor outcome. We present a comprehensive approach to identifying and managing acute kidney injury with RPGN features due to suspected IgA nephropathy in a low-resource setting.

Case Illustration

A 34-year-old male was taken to a tertiary hospital after complaining of weakness for the last two weeks, which was accompanied by edema in his lower legs. The edema had been present for the past week. During the past week, the patient also complained of reduced urination with a reddish hue. The patient acknowledged to have had a prior cough and cold. On physical examination, the blood pressure was 170/100 mmHg, and all other vital signs were within normal range. There was pitting edema in both lower legs. The patient was anuric. The examination of the head, chest, and abdomen revealed no abnormalities. A full blood count showed hemoglobin 14.3 mg/dL, leukocytes 31,910/L, and platelets 289,000/L.

The kidney function tests revealed serum creatinine 7.9 mg/dL, urea 316 mg/dL, and blood urea nitrogen (BUN) 147.66 mg/dL. Kidney function testing two weeks before revealed serum creatinine 3.1 mg/dL, urea 73 mg/dL, and BUN 34.11 mg/dL. The albumin level was 3.4 g/dL, total cholesterol 124 mg/dL, and triglycerides 239 mg/dL. Urinalysis revealed +3 protein levels, >400/LPB leukocyte sediment, 100-150/LPB red blood cell sediment, and positive red blood cell casts. Proteinuria was 4878 mg/24 hours. The anti-streptolysin O (ASTO) test was negative, as did the antinuclear antibody-immunofluorescence (ANA-IF) test. The C3 level was normal. The chest X-ray revealed normal lungs. Abdominal ultrasound revealed thickening of bilateral kidney parenchyma, with no stones or space-occupying lesions. The patient was diagnosed with acute kidney injury caused by acute glomerulonephritis from suspected IgA nephropathy with RPGN features. The acute condition in chronic renal disease served as a differential diagnosis. The patient had a methylprednisolone pulse dose of 2 x 500 mg for 3 days, followed by prednisone 2 x 20 mg. Candesartan (1x8 mg) was used to manage blood pressure. Renal support therapy with hemodialysis was conducted five times. After two weeks of medication, the patient's symptoms improved. The patient was discharged after continuous corticosteroid therapy, and hemodialysis was discontinued. At the 10-day follow-up, blood pressure was 120/60 mmHg. Kidney function tests revealed urea 45 mg/dL, serum creatinine 0.8 mg/dL, and BUN 21.03 mg/dL. Urine analysis revealed +1 protein, +1 blood, and 15-20/LPB red blood cell sediment.

Discussion

The most frequent signs of acute glomerulonephritis are elevated blood pressure (hypertension), proteinuria (excess protein in the urine), and hematuria. GN with dominant podocyte damage causes nephrotic syndrome, which is characterized by severe proteinuria and leg edema.[1] The patient's clinical findings included hypertension (blood pressure 170/100 mmHg), pitting edema in both lower limbs, and laboratory results that showed 24-hour urine protein of 4878 mg, microscopic hematuria with erythrocyte sediment 100-150/HPF, erythrocyte casts (+), and +3 proteinuria, all of which were

consistent with GN. Proteinuria implies podocyte damage, whereas hematuria shows damage to the glomerular basement membrane.[1] RPGN often causes acute episodes of glomerulonephritis in glomerular disorders.[3] RPGN is a type of acute glomerulonephritis characterized by a sudden and progressive decline in kidney function followed by kidney failure, as indicated by a more than two-fold increase in blood creatinine within days to weeks, as well as edema, hypertension, oliguria to anuria, and active urine sediment.[8] The primary causes of RPGN are small vessel vasculitis and anti-GBM illness. However, IgA nephropathy, thrombotic microangiopathy, lupus nephritis, and post-streptococcal glomerulonephritis can all induce RPGN.[3]

Blood Test	
Haemoglobin	14.3 mg/dL
Leukocytes	**31.910/µL ↑**
Platelets	289.000/µL
Haematocrit	**43 % ↑**
Serum creatinine	**7.9 mg/dL ↑**
Ureum	**316 mg/dL ↑**
Blood Urea Nitrogen (BUN)	**147.66 mg/dL ↑**
Natrium	**124 mmol/L ↓**
Potassium	4.5 mmol/L
Chlorida	**89 mmol/L ↓**
Albumin	**3.4 g/dL ↓**
Total cholesterol	124 mg/dL
Triglycerides	**239 mg/dL ↑**
ASTO	<200 **N**
ANA-IF	Negative **N**
C3	89mg/dL

Urine Test	
Protein	**+3 ↑**
Leukocyte sediment	**>400/LPB ↑**
Red blood cell sediment	100-150/LPB
Red blood cell casts	**Positive**
Proteinuria	**4878 mg per 24 hours ↑**

Figure 1. Laboratory Result

Figure 2. Patient's kidney function during hospitalization

IgA nephropathy appears clinically as recurring episodes of macroscopic hematuria during or after upper respiratory tract infections, frequently accompanied by chronic proteinuria or microscopic hematuria.[10] Kidney biopsy specimens with dominant or codominant immunoglobulin A mesangial deposits must be histopathologically examined to confirm IgA nephropathy. Primary IgA nephropathy is diagnosed when the disease affects only the kidneys. However, IgA may arise as a secondary extrarenal clinical manifestation in illnesses such as chronic liver disease, diabetes, hypertension, and lupus, referred to as secondary IgA nephropathy.[3]

According to Kidney Disease: Improving Global Outcomes (KDIGO) 2021, rapidly progressive IgA nephropathy is defined as a progressive increase in serum creatinine by 50% or higher over three months or faster, with other causes of RPGN (e.g., ANCA-associated vasculitis, anti-GBM disease) and reversible causes (e.g., drug toxicity, pre- and post-kidney etiology) have been excluded. A kidney biopsy is required to diagnose IgA nephropathy with RPGN characteristics, showing mesangial and endocapillary hypercellularity and crescents accompanied by focal necrosis in a high proportion of kidney glomeruli.[11]

In our case, a more than two-fold rise in creatinine levels, edema, hypertension, anuria, proteinuria, microscopic hematuria, and erythrocyte casts raises the possibility of RPGN. The examination findings do not indicate pre-renal variables and chronic kidney failure or post-renal factors, which are not suggested by ultrasonography. After starting corticosteroid medication, the patient's kidney function quickly recovered, and his clinical condition improved. However, due to a lack of availability in our facility, a kidney biopsy could not be done, making it impossible to determine the precise cause of RPGN. By obtaining negative ANA IF and ASTO values, lupus nephritis and post-streptococcal glomerulonephritis can be ruled out as causes of RPGN. The patient's clinical signs and symptoms matched those of IgA

nephropathy. The patient denied having fever, hemoptysis, shortness of breath, arthralgia/arthritis, or purpura. An X-ray of the chest showed no abnormalities. The levels of hemoglobin and platelets were within normal ranges. The clinical signs that were accessible and the supporting exams conducted did not indicate small vessel vasculitis, anti-GBM disease, or thrombotic microangiopathy, despite the limitations in anti-GBM antibody and antineutrophil cytoplasmic antibody (ANCA) tests.[2,11]

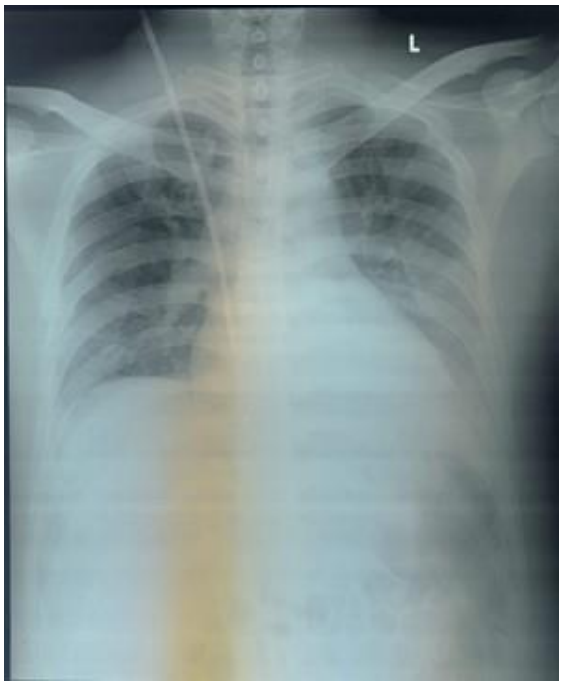

Figure 3. Chest x-ray result. Cor and Pulmo are within normal limits

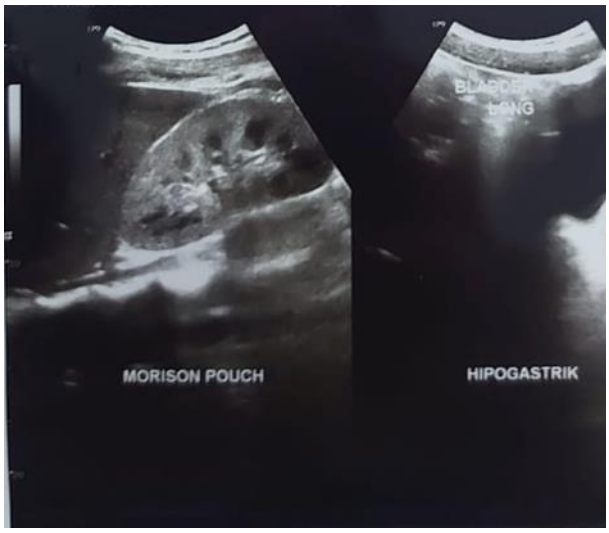

Figure 4. Patient's Abdominal Ultrasound result. Right and left kidney: normal shape and size. Increased parenchymal echogenicity. No stones or space-occupying lesions (SOL) were detected.

Uncontrolled hypertension increases proteinuria levels and leads to a faster decrease in renal function. The goal is to maintain systolic blood pressure below 120 mmHg, with ACE-I and ARB being the preferred antihypertensive medicines.[11] Oral corticosteroids and oral cyclophosphamide are used to treat RPGN, with pulse dose methylprednisolone being a key component in the treatment plan.[12]

Combining cyclophosphamide or azathioprine with corticosteroid is only recommended when crescentic IgA nephropathy is detected.[3] This patient received 500 mg/day of methylprednisolone pulse treatment, followed by two doses of 20 mg of prednisone. Candesartan 1 × 8 mg was used as an initial dosage to manage blood pressure. Hemodialysis was conducted as renal support five times before being terminated. The patient responded well to medication, as seen by stable blood pressure and improved renal function, with an initial serum creatinine level of 7.9 mg/dL dropping to 0.8. Corticosteroids and antihypertensive medication have been proven in studies to enhance outcomes.[13] Other studies needed dialysis due to steroid resistance.[14] In this study, dialysis was begun concurrently with corticosteroid and antihypertensive medication.[15] Anuria, leg edema, and a blood creatinine level were all considered indications for hemodialysis.

Conclusion

Diagnosing RPGN and its etiology is challenging, particularly in resource-limited situations. Due to limited resources, no kidney biopsy was conducted in this case. Clinical symptoms and primary diagnostic tests might be beneficial, such as renal function tests, urinalysis, urine protein levels, abdominal ultrasonography, and serological testing. The patient received corticosteroids, antihypertensives, and hemodialysis, which resulted in rapidly improved clinical and renal function.

Declarations

Competing interests

The authors declare no conflict of interest.

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None.

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