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Anuric Acute Kidney Injury Requiring Dialysis Following Acetazolamide Use for Cataract Surgery

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Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Funds Collection G

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Conflict of interest: None declared

Patient: Male, 62-year-old
Final Diagnosis: Acute kidney injury
Symptoms: Anuria
Medication: —
Clinical Procedure: —
Specialty: General and Internal Medicine • Nephrology • Ophthalmology

Objective: Unusual or unexpected effect of treatment

Background: Acetazolamide (ACTZ) is commonly used in the prevention and treatment of various clinical conditions, and anuric acute kidney injury (AKI) is one of its known life-threatening complications.

Case Report: We hereby report the case of a middle-aged man known to have compensated heart failure and hypertension with previously normal kidney function, who received a total dose of 2250mg of ACTZ over 3 days after cataract surgery. One week after the operation, he presented with anuria and severe bilateral renal colic, as well as progressively worsening kidney function and metabolic profile, which eventually required hemodialysis prior to recovery.

Conclusions: The cause of the AKI was attributed to intra-tubular obstruction by ACTZ-induced crystalluria, which required discontinuing the offending agent and dialysis to correct the kidney functions.

Keywords: Acetazolamide • Acute Kidney Injury • Anuria • Crystallization • Dialysis

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/931319

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Background

Acetazolamide (ACTZ) is a carbonic anhydrase inhibitor diuretic used for the management of several conditions, including glaucoma, pseudotumour cerebri, seizures, metabolic alkalosis, and in prophylaxis against altitude sickness [1]. Its known adverse effects are usually mild, such as nausea, vomiting, fatigue, abdominal pain, and paresthesia, and, less commonly, kidney stones and electrolyte imbalances, and even more rarely, Stevens-Johnson syndrome, aplastic anemia, and fulminant hepatic necrosis [2]. A few reports over the years recognized acute kidney injury (AKI) as a potential complication of ACTZ use, mainly due to crystalluria causing intra-tubular obstruction, but this adverse effect remains relatively unknown [3-7]. In addition, most of the cases resolved spontaneously with supportive management and rarely required dialysis [3-5,7].

We hereby report the case of a gentleman with previously normal kidney function, who developed anuric AKI requiring hemodialysis following the use of ACTZ post-cataract surgery.

Case Report

Our patient was a 62-year-old man, known to have essential hypertension and mild left ventricular systolic dysfunction, with normal renal function (98 µmol/L), maintained on anti-heart failure treatment (furosemide 40 mg daily, spironolactone 25 mg daily, Lisinopril 10 mg daily and bisoprolol 5 mg daily) and followed regularly in the cardiology clinic.

He had undergone cataract surgery in his right eye at another hospital 1 week before presentation to our hospital, and acetazolamide 250 mg 3 times daily was added to his regimen.

He presented to our emergency room with anuria and worsening colicky flank pain of 2 days' duration, for which he was also seen the day before in another hospital. His work-up there was non-revealing except for a mildly elevated serum creatinine (127 µmol/L), which was thought to be due to volume depletion; his diuretics were stopped and he was referred to the nephrology clinic.

He had no history of febrile illness, no intake of NSAID or other medication, but reported hematuria at the symptom onset, following which his urine output started to decrease. No other urinary or gastro-intestinal complaints were presented.

In our hospital, the patient was afebrile, hemodynamically stable, and his physical exam showed evidence of volume depletion but was otherwise non-contributory.

Bed-side ultrasound revealed an empty bladder that was confirmed by urinary catheterization, with normal size and echogenicity of both kidneys, no evidence of renal stones, and normal prostate. Serum creatinine and urea nitrogen were 171 µmol/L and 7.5 mmol/L, respectively, and his serum bicarbonate 15 mmol/L. Additional work-up revealed negative viral serology for HBV, HCV and HIV, normal Doppler imaging of renal arteries and veins, and normal creatine phosphokinase and serum complement levels, as well as connective tissue serology and a plain CT abdomen/pelvis that revealed bilateral diffuse perinephric fat stranding and no perinephric collections. No urinary sample was collected until then for testing.

He was admitted to the hospital, started on IV fluids, empiric antibiotic coverage for possible urinary tract infection, and pain control. His diuretics and lisinopril were stopped.

Over the next 2 days, he remained anuric with worsening crampy abdominal pain and rapidly increasing serum creatinine values (**Figure 1**) reaching 739 µmol/L, as well as worsening metabolic parameters requiring hemodialysis initiation, with a plan to schedule a renal biopsy following a few dialysis sessions.

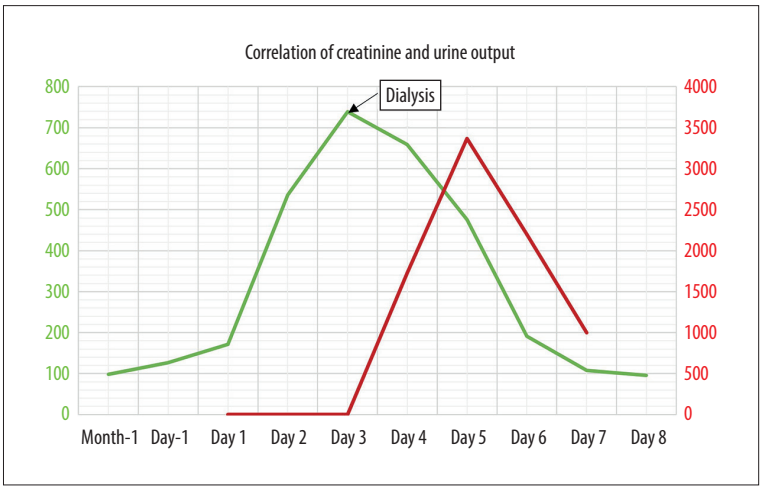

Figure 1. Correlation of creatinine and urine output.

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However, overnight, the patient started passing bloody urine with instant resolution of his abdominal pain, and over the next few days he showed significant improvement of his renal function back to baseline, and he was discharged home in a stable condition. A biopsy was not performed.

Discussion

We described an uncommon manifestation of a commonly used medication that warranted an extensive literature review.

The first reports of renal injury following ACTZ intake date back to the 1950s, when several patients were reported to have "sulfonamide crystalluria" either post-mortem or after presenting with colicky flank pain and anuria and were found to have bilateral ureteric obstruction that required catheterization [3,4].

A similar presentation was also described in 1978 in 2 patients who presented with hemorrhagic anuria in addition to the above complaints, following ACTZ exposure of short- to medium-term duration, and also recovered their renal function following release of the ureteric obstruction [5].

In 2014, Neyra et al encountered a case of AKI requiring 2 sessions of hemodialysis in a 55-year-old healthy man who received ACTZ for acute mountain sickness prophylaxis prior to ascending a summit in Peru and commented that care should be provided while using this drug even in healthy travelers taking it for recreational reasons [6].

More recently, use of only 2 doses of ACTZ, 1 week apart, for metabolic alkalosis in an ICU patient, was also reported to have caused renal colic, hemorrhagic anuria, and AKI, which later resolved with IV fluid administration [7].

The only tissue evidence of crystalluria causing intra-tubular obstruction and retrograde flow of urine was described by Rosset et al in 1989 when a renal biopsy was performed on a patient presenting with acute colicky pain and anuria without radiologic evidence of obstruction. The renal biopsy showed evidence of tubular damage with accumulation of debris and crystals, and immunofluorescence showed deposition of Tamm-Horsfall protein in the Bowman's space of more than half of the glomeruli, which is thought to cause the intra-tubular obstruction [8].

In most of the cases reported before, the acute kidney injury resolved with IV fluid administration, but this was not sufficient in the present patient. He required 1 session of hemodialysis, following which he quickly recovered.

It should be noted that while performing a literature search on the current topic, we came across a new hypothesis that is being tested about the effectiveness of using ACTZ for prevention of AKI in COVID-19 patients by preventing the proximal tubular damage caused by the virus [9].

Conclusions

AKI from acute crystalluria is a potentially life-threatening complication that is increasingly reported following ACTZ use. We would like to emphasize that healthcare workers should be aware of this rare adverse effect, be very careful in prescribing this medication in combination with other diuretics, and should advise patients to maintain adequate hydration while using it.

Conflict of Interest

None.

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