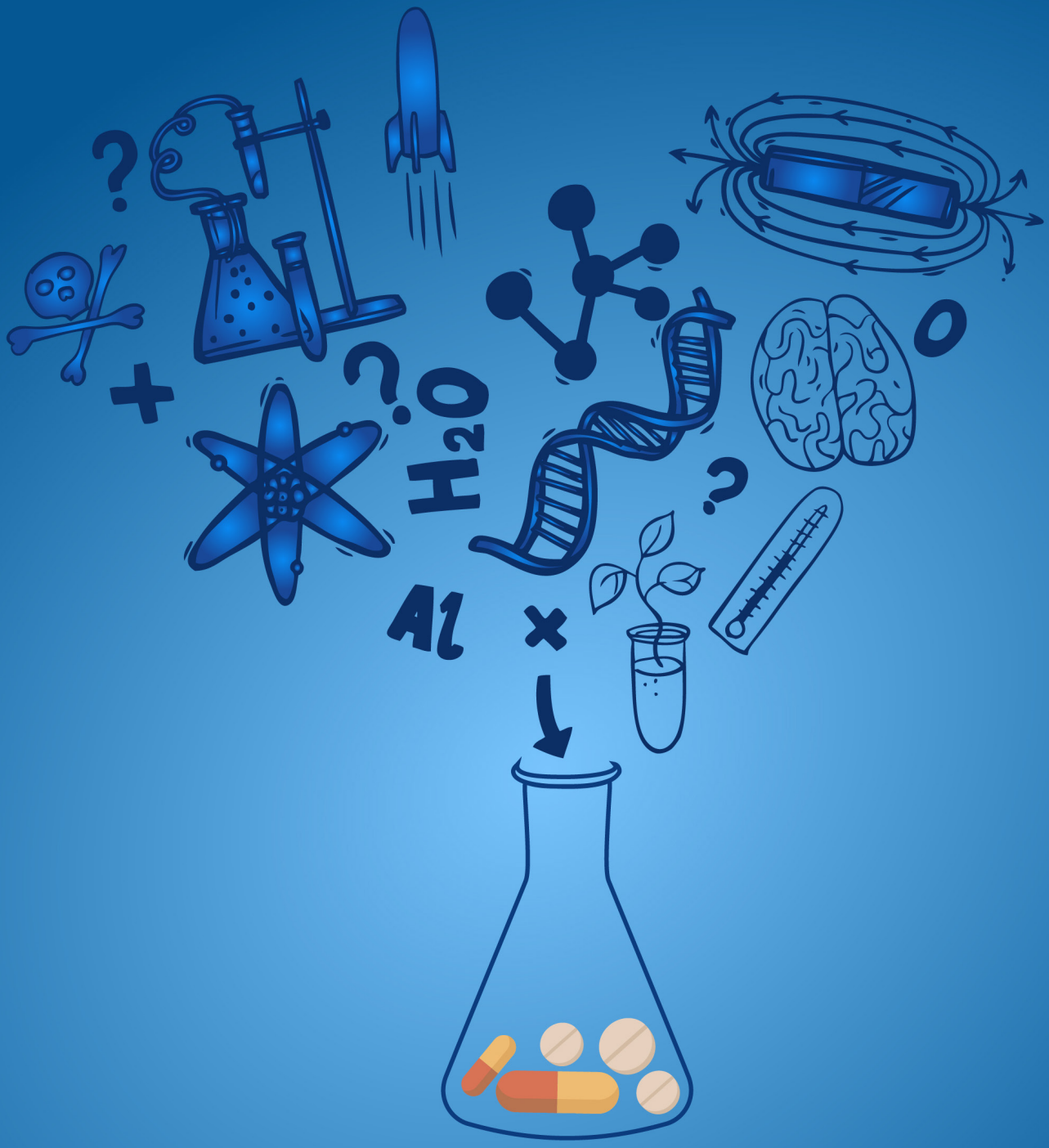
AMERICAN JOURNAL OF CHEMISTRY AND PHARMACY (AJCP)

ISSN: 2834-0116 (ONLINE)

VOLUME 1 ISSUE 2 (2022)



PUBLISHED BY: E-PALLI, DELAWARE, USA

American Journal of Chemistry and Pharmacy (AJCP)

Volume 1 Issue 2, Year 2022
ISSN: 2834-0116 (Online)
DOI: https://doi.org/10.54536/ajcp.v1i2.829
https://journals.e-palli.com/home/index.php/ajcp

Oral Acyclovir Induced Acute Kidney Injury

Yasser Sadawey[1*], Yasameen Abdulhameed[1]

Article Information

Received: October 18, 2022

Accepted: October 29, 2022

Published: November 01, 2022

Keywords

Oral Acyclovir, Acute Kidney Injury, Acyclovir Nephrotoxicity, Medicine

ABSTRACT

Acyclovir is an antiviral medication often used to treat outbreaks of herpes in children. Acyclovir has an exceptional safety profile; there is a possibility that it might induce severe nephrotoxicity in rare cases. In this report, we present the case of a 17-year-old girl with acute renal injury as a side effect of using acyclovir. The patient was admitted for three days due to drug-induced AKI, which was reversed by discontinuing the afflicted medicine (acyclovir), initiating appropriate hydration with intravenous normal saline 0.9%, and refraining from any nephrotoxic medications. Following up a week later, the patient was asymptomatic and had normal kidney function. Therefore, it is critical to use acyclovir correctly to avoid possibly fatal consequences.

INTRODUCTION

Acyclovir is now the most effective treatment for several herpes viruses, such as herpes encephalitis (Balfour H. H., 1984; YY., 1984), varicella zoster virus (VZV), or herpes simplex virus (HSV) infections in children with compromised immune systems. In addition, high-dose intravenous acyclovir to combat viral infections may be beneficial (YY., 1984). The adverse effects of acyclovir are well-known; nonetheless, most people do not consider it. The most prevalent underlying mechanism that acyclovir may generate is crystal nephropathy, which is reported to have the adverse side effect of inducing acute renal injury (AKI). It is hypothesized that the mechanism that causes the damage is the precipitation and crystallisation of the medicine inside the renal tubules, which results in obstruction and perhaps cellular necrosis (Izzedine, 2005; Mason, 2008). Patients with acyclovir-induced acute kidney injury have a fast reduction in their renal function and an increase in their blood creatinine level. This usually occurs between 12 and 48 hours after administering the medicine (Yildiz C, 2013; Zhang Y, 2016). Appropriate diagnosis and management of AKI caused by acyclovir are necessary for an effective prognosis(Zhang Y, 2016). In this report, we present a case of a 17-year-old girl who developed an acute kidney injury as a side effect of acyclovir in the management of herpes zoster infection.

METHODOLOGY

Case Presentation

Seventeen years old female with known epilepsy was admitted to our hospital. She was diagnosed five years ago with epilepsy and started on treatment for a few weeks with poor compliance due to medication side effects. She has a five-day history of skin rash affecting her upper back and right shoulder (itchy, vesicular, painful, and affecting a dermatomal distribution of cervical 4,5 and 6) associated with nausea and vomiting at the time of admittance in another facility. During that period, she was started on acyclovir 800 mg orally three times daily for the diagnosis of herpes zoster infection, Diclofenac sodium 50 mg twice and levetiracetam 500 mg orally every 12 hours. Unfortunately, she was discharged one day before her current presentation to our hospital. She also gave a history of reduced urine output. Upon arrival, she was vitally stable and afebrile, weighted 60 kg with normal capillary refill time but dry mucous membranes. Systemic examination, apart from mild epigastric tenderness, was reported as unremarkable. Neurological examination revealed unremarkable results, including motor, sensory, cranial nerves, and cerebellar functions, and no photophobia or neck stiffness.

Chest X-ray and ultrasound abdomen were unremarkable. CT head done earlier showed mucosal thickening and retention cyst of left maxillary sinuses. Her laboratory results showed creatinine of 202wμ mol/L, normal electrolytes and pH 7.33, and HcO3 18 mEq/L, lactate 0.8 mmol/L. She was admitted as having acute kidney injury, probably drug-induced, using the Naranjo algorithm of adverse drug reaction. The patient was admitted for three days as drug-induced AKI, and the culprit drug (acyclovir) was stopped with the initiation of proper hydration with normal intravenous saline 0.9% and avoiding all nephrotoxic medications. She was started on metoclopramide 10 mg intravenous when needed, pantoprazole 40 mg intravenous once daily, and paracetamol 1 gm for pain control, daily renal function tests showed improvement of kidney functions, and she was tolerant of oral intake. Upon follow-up a week later, a patient had normal kidney functions and was asymptomatic.

[1] Department of Medicine, Mediclinic ME, Al Jowhara Hospital, AL Ain, UAE
[*] Corresponding author's e-mail: yassersadawey12@outlook.com

Table 1: Laboratory Values of admitted case

	Normal Value	Feb 2021 Baseline	2 days pre admission	1 day pre admission	Day 1 Admission	Day 2	Day 3	Follow up in 1 week
Sodium	136-145 mmol/L	140	139	139	138	141	140	136
Potassium	3.2-5.5 mmol/L	4.3	4.2	4.2	4.2	3.8		4.5
Chloride	98-107 mmol/L	105	104	103	101.4	106.6	103.8	
Urea	2.8-8.1 mmol/L	6.3	4.5	6.5	9.1	6.9	3.9	3.7
Creatinine	34-80 micrmol/L	56	118	231	206	148	82	65
CO_3	22-29 mmol/L	26	24	19	-	-	-	-
pH	7.35-7.45	NA	7.35	7.35	-	-	-	-
CRP	<5mg/L	NA	5.3	28.8	35	26	10	-
Alkaline Phosphatase	48-95 U/L	-	-	-	109	-	-	-
ALT	0-17 U/L	-	-	-	12.2	-	11.1	-
Amylase	29-118 U/L	-	-	-	57	-		-
AST	0-23 U/L	-	-	-	15.8	-	13	-
Calcium	2.31-2.64 mmol/L	-	-	-	2.35	-	-	-
TSH	0.5-4.5 microIU/ml	-	-	-	-	-	1.89	-
HCT (PCV)	31-42%	-	-	-	32.8	-	29.4	34.9
Haemoglobin	10.9-14.3 g/dL	-	-	-	10.6	-	9.5	11.2
Basophils %	0.4-1.3%	-	-	-	0.3	-	0.4	0.5
Eosinophils %	0.4-8.2 %	-	-	-	1.2	-	2.4	3.1
Lymphocytes %	20.1-48.8 %	-	-	-	27.6	-	28.8	5.7
MCH	24.7-32.8 pg	-	-	-	23	-	22.9	23.2
MCHC	32.3-35.6g/dL	-	-	-	32.3	-	32.4	32
MCV	75.5-95.3 fL	-	-	-	71.3	-	70.7	72.4
Monocytes %	4.10-12.90%	-	-	-	11.3	-	13	10.3
Neutrophils %	42.8-75.1 %	-	-	-	59.6	-	55.4	80.4
Platelet count	150-410 10^3/µL	-	-	-	249	-	237	264
Red Cell Count	3.63-4.92 10^6/µL	-	-	-	4.6	-	4.15	4.82
White Cell Count	3.8-11.8 10^6/µL	-	-	-	6.7	-	6.2	7.4
Urine Rotine	-	-	-	-	-	-	-	-
Blood (RBC)	negative	-	-	-	Negative	-	Negative	-
Ketone	negative	-	-	-	Positive +	-	Negative	-
Protein	negative	-	-	-	Negative	-	10 mg/dl	-
Amorphous Urate	Nil	-	-	-	Nil	-	Nil	-
Amorphous Phosphate	Nil	-	-	-	Nil	-	Nil	-
Bilirubin	negative	-	-	-	Negative	-	Negative	-
Crystals	Nil	-	-	-	Nil	-	Nil	-
Fatty casts	Nil	-	-	-	Nil	-	Nil	-
Granular Casts	Nil	-	-	-	Nil	-	Nil	-
Hyaline Casts	Nil	-	-	-	Nil	-	Nil	-

RBC casts	Nil	-	-	-	Nil	-	Nil	-
WBC casts	Nil	-	-	-	Nil	-	Nil	-
Glucose	negative	-	-	-	Negative	-	Negative	-
Leukocytes	0-5 cell/HPF	-	-	-	10-Jun	-	0-5	-
Leukocyte esterase	negative	-	-	-	Positive +	-	Negative	-
Nitrite	negative	-	-	-	Negative	-	Negative	-
pH	5-9 pH	-	-	-	5	-	6	-
Bacteria	Nil	-	-	-	Few ++	-	Nil	-
Specific Gravity	1.003 - 1.035	-	-	-	1.01	-	1.009	-

DISCUSSION

Nephropathy caused by oral acyclovir is uncommon and only manifests itself at very high doses (more than 500 mg/m2) when the medication is used by patients whose volume status has significantly reduced (Perazella., 1999). It is critical to know the possible nephrotoxicity for the patients being treated with acyclovir. Our patient had an acute kidney injury while taking oral acyclovir and other nephrotoxic drugs and being volume depleted, but her creatinine improved when acyclovir stopped Therefore, acyclovir crystalluria and subsequent intrarenal obstruction and nephropathy would be the most plausible explanation for the observed renal injury, even if the crystals were undetected on regular urine analysis. In individuals with underlying volume depletion and renal insufficiency, acyclovir dosage should be lowered. To avoid crystallisation and eventual tubular blockage, gradual medication infusion over 1-2 hours, appropriate fluid replenishment, and introduction of high urine flow rates (100-150 ml/h) should be recommended (Brigden *et al*., 1982; Sawyer *et al*., 1988).

Renal function should be monitored regularly in patients receiving high-dose intravenous acyclovir in patients diagnosed with renal impairment at any dosage level. Common symptoms include unusual sickness, nausea, abdominal discomfort, vomiting, and muscle twitching while receiving treatment (Wade JC, 1983).

When serum creatinine levels rise, acyclovir must be managed to be discontinued. Hydration should be maintained during therapy to ensure a high urine flow(Gunness P, 2010). If no improvement is observed in patients with renal function soon after discontinuing acyclovir, other causes of renal toxicity should be sought. Treatment may be maintained at a lower dose for secondary infections that respond to acyclovir while a renal function is closely monitored. Since volume contraction may go undiagnosed in outpatients treated with acyclovir, they are more susceptible to acyclovir-induced kidney damage(Chawla, 2017).

CONCLUSION

It is concluded that to prevent morbidity, acute kidney injury must be diagnosed as soon as possible (Ratan., 2003). Since acyclovir is frequently prescribed for renal transplantation, patients with herpes simplex virus and herpes zoster infections, and patients with Neurological viral infections, therefore, practitioners must be aware of the associated risk, side effects, and how drug-related issues might be addressed.

Ethical Approval

Ethical approval for this study was obtained from Mediclinic Al Jowhara Hospital (Reference number: UHN: 1238416). All procedures performed in the study involving the patient were by the ethical standards of the governmental guidelines and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this case report.

Funding

Any grants did not fund this work.

Informed Consent

Written informed consent was obtained from the participant.

REFERENCE

Balfour H. H., J. (1984). Intravenous acyclovir therapy for varicella in immunocompromised children. . *The Journal of pediatrics, 104*(1), 134-136. https://doi.org/ https://doi.org/10.1016/s0022-3476(84)80611-3

Brigden, D., Rosling, A. E., & Woods, N. C. (1982). Renal function after acyclovir intravenous injection. *The American journal of medicine, 73(*1), 182-185.

Chawla, L., Bellomo, R., Bihorac, A. *et al.* . (2017). Acute kidney disease and renal recovery: consensus report of the Acute Disease Quality Initiative (ADQI) 16 Workgroup. *Nat Rev Nephrol 13,* 241-257. https://doi.org/https://doi.org/10.1038/nrneph.2017.2.

Gunness P, A. K., Koren G. (2010). The effect of acyclovir on the tubular secretion of creatinine in vitro. *J Transl Med., 30*(8), 139. https://doi.org/10.1186/1479-

5876-8-139

Izzedine, H., Launay-Vacher, V., & Deray, G. (2005). Antiviral drug-induced nephrotoxicity. *American journal of kidney diseases : the official journal of the National Kidney Foundation, 45*(5), 807-817. https://doi.org/https://doi.org/10.1053/j.ajkd.2005.02.010

Mason, W. J., & Nickols, H. H. . (2008). Images in clinical medicine. Crystalluria from acyclovir use. *The New England journal of medicine, 358*(13). https://doi.org/https://doi.org/10.1056/NEJMicm066726 (14)

Perazella., M. A. (1999). Crystal-induced acute renal failure. *American Journal of Medicine, 106*(4), 459-465.

Ratan., P. K. S. a. S. K. (2003). A case of chronic renal dysfunction following treatment with oral acyclovir. *Scandinavian Journal of Infectious Diseases, 35*(10), 770-772.

Sawyer, M. H., Webb, D. E., Balow, J. E., & Straus, S. E. (1988). Acyclovir-induced renal failure: clinical course and histology. *The American journal of medicine, 84*(6), 1067-1071.

Wade JC, M. J. (1983). Neurologic symptoms associated with parenteral acyclovir treatment after marrow transplantation. *Ann Intern Med, 98*, 921-925.

Yildiz C, O. Y., Gucer S, Cengiz AB, Topaloglu R. (2013). Acute kidney injury due to acyclovir. *CEN Case Rep, 1*, 38-40. https://doi.org/10.1007/s13730-012-0035-0

YY., B. (1984). The use of acyclovir in children. *Pediatric infectious disease, 3*(4), 575-578. https://doi.org/https://doi.org/10.1097/00006454-198407000-00017

Zhang Y, C. Y., Teng Y. (2016). Acute renal injury induced by valacyclovir hydrochloride: A case report. *Exp Ther Med,* 6, 4025-4028. https://doi.org/10.3892/etm.2016.3905.