International Journal of Research in Medical Sciences
Simpson MD et al. Int J Res Med Sci. 2024 Jul;12(7):2597-2600
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20241918

Case Report

From crisis to recovery: a case report and literature review of early extracorporeal membrane oxygenation and esophagogastroduodenoscopy intervention in a patient with extended-release bupropion overdose

Matthew D. Simpson[1]*, Kojo-Frimpong Awuah[1], Sujith Modugula[2], Dhaval Patel[2], Tariq Cheema[2]

[1]Department of Internal Medicine, Allegheny General Hospital, Pittsburgh, PA, USA
[2]Department of Pulmonary and Critical Care, Allegheny General Hospital, Pittsburgh, PA, USA

Received: 10 May 2024
Accepted: 11 June 2024

***Correspondence:**
Dr. Matthew D. Simpson,
E-mail: matthew.simpson@ahn.org

ABSTRACT

Drug poisoning, including bupropion overdose, presents significant clinical challenges with rising mortality rates. Extracorporeal membrane oxygenation (ECMO) has emerged as a potential therapeutic option, particularly in cases of cardiovascular collapse refractory to conventional treatment. However, the role of early ECMO initiation in bupropion intoxication remains under-explored. We present a case of a 41-year-old male with an extended-release bupropion overdose who developed cardiovascular collapse despite standard interventions. The patient underwent early initiation of ECMO and esophagogastroduodenoscopy for drug removal. Within 72-hours of ECMO initiation, the patient demonstrated significant hemodynamic improvement and was successfully weaned off vasopressors. The patient was extubated and transitioned to the medical floors with continued improvement. Early ECMO initiation may be beneficial in bupropion overdose cases presenting with cardiovascular collapse refractory to standard interventions. This case highlights the potential role of ECMO in managing severe bupropion intoxication and suggests further exploration of ECMO as an early intervention in drug poisoning cases.

Keywords: Extra corporeal membrane oxygenation, Esophagogastroduodenoscopy, Bupropion overdose

INTRODUCTION

Managing drug overdose from extended-release (ER) medications presents unique challenges due to their pharmacokinetic properties, including prolonged absorption time and delayed peak concentration.[1] Severe overdose cases may lead to rebound symptoms and an incomplete response to conventional decontamination methods. Multiple cases have shown that prolonged exposure to undigested toxins leads to significant morbidity and mortality thus early intervention is warranted.[2] Extracorporeal membrane oxygenation (ECMO) has emerged as a life-saving intervention in such cases, providing crucial support to the heart and lungs.[3] Additionally, early gastric decontamination (EGD) may offer significant benefits by facilitating prompt drug elimination from the body.[4]

Roughly 98,268 persons died from drug related overdoses in 2021- an 11.9% increase from years prior- but therapeutic options for managing specific overdoses remain limited.[5] Bupropion overdose, in particular, poses significant clinical challenges and often results in cardiovascular collapse. Here, we presented a case of ER bupropion overdose where traditional treatment modalities failed, necessitating the initiation of ECMO and EGD as rescue therapies. This case underscores the importance of early recognition and intervention, highlighting the

potential role of ECMO in managing severe bupropion intoxication.

CASE REPORT

The patient was a 41-year-old male with a notable psychiatric history of major depressive disorder, and prior suicide attempts with overdose who was evaluated in the emergency department (ED) after he was found thrashing on the floor next to six empty bottles of bupropion. On arrival at the ED, the patient was afebrile, tachycardic (122 bpm), had a respiratory rate of 30 breaths per minute, blood pressure of 134/85 mmHg, and was maintaining optimal blood oxygen levels on room air. The patient was noted to be responsive to painful stimuli but not verbal instructions. He received lorazepam and acetylcysteine and were given bicarbonate all intravenously. The ED laboratory workup indicated negative aspirin and ethanol levels, with acetaminophen levels mildly elevated at 16.9 µg/ml.

The urine drug screen was positive for amphetamines and cannabinoids. Venous blood gas results were acidotic, and the partial pressure of carbon dioxide was 60 mmHg. The patient became more somnolent and unresponsive, so he was intubated for airway protection and then transferred to the medical intensive care unit (MICU). While in the MICU, the patient became progressively bradycardic, and hypotensive. He was treated with atropine, and bicarbonate; norepinephrine, vasopressin, and epinephrine drips were initiated.

The patient experienced witnessed seizure activity for which he received lorazepam and diazepam. Serial electrocardiograms revealed widened QRS despite multiple doses of bicarbonate. The patient was then given a lidocaine bolus and started on lidocaine drip without notable improvement. He was then given intralipid emulsion therapy which temporarily narrowed his QRS. However, 20 minutes later, his QRS interval was 202 msec and his lactic acid levels were 6.2 mmol/l. A transthoracic echocardiogram showed a reduced ejection fraction of 15-20%, and severe left ventricular global hypokinesis, indicating possible cardiogenic shock. The shock team was called, and the decision was made to take the patient to the catheterization laboratory for veno-arterial ECMO with an aortic balloon pump in the setting of cardiogenic shock. While on ECMO, the patient's abdomen was scanned using computed tomography (CT) with contrast. This revealed a bezoar suspected to be the retained medications in the stomach (Figure 1).

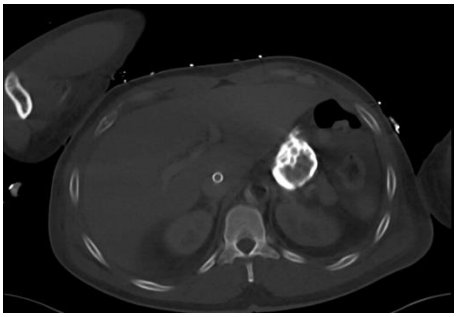

Figure 1: Contrasted CT abdomen showing what is suspected to be a bezoar containing undigested bupropion capsules.

Bupropion can take around 4 days to digest.[6] The patient then underwent esophagogastroduodenoscopy for removal of 50-60 bupropion tablets and administering activated charcoal (Figure 2). The patient continued to have hemodynamic improvement, and within 72-hours of ECMO initiation, the patient was decannulated with removal of vasopressors. The patient was extubated to room air 8 days after decannulation. A second transthoracic echocardiogram showed normal left ventricular systolic function and ejection fraction of 55 to 60%. The patient remained hemodynamically stable and was eventually discharged from the hospital with close psychiatric follow-up.

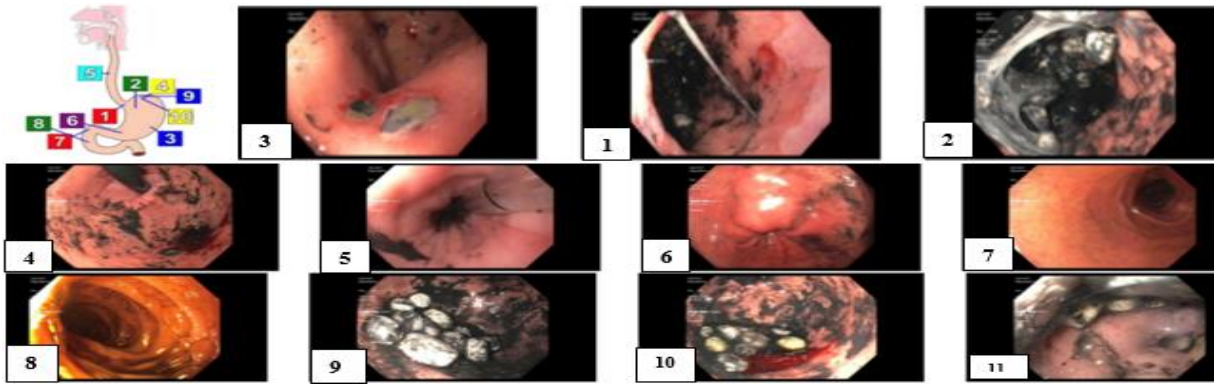

Figure 2: EGD showing upper endoscopic views depicting a large amount of medication capsules in the stomach and oropharynx.

Note: (3) ulcer gastric body; (1) gastroesophageal junction; (2) gastric body pills with large volume of activated charcoal; (4) gastric fundus, gastric body cleared of pills; (5) middle- third of the esophagus- NG in place; (6) gastric antrum- pre-pyloric stomach cleared of pills; (7) duodenal bulb; (8) 2nd position of the duodenum; (9) gastric fundus; (10) gastric fundus/friable oozing mucosa; and (11) pills in oropharynx.

DISCUSSION

This case is an excellent illustration of the use of ECMO to sustain a patient during cardiovascular collapse caused by an overdose. Drug poisoning has been a critical health issue for many years with devastating consequences, and bupropion poisoning has been particularly difficult to manage due to its various critical presentations.[7] Bupropion overdose is known for its potential to cause severe central nervous system and cardiovascular toxicity resulting in seizures, arrhythmias, shock, and cardiac arrest in high doses. Bupropion overdose at the cellular level allows for the blockage of the rapid component of the delayed rectifier potassium currents and affects intercellular communications. This tampering of the cardiac conduction system is believed to be what leads to QT prolongation, arrhythmias, and cardiogenic shock.[8] Current management guidelines for bupropion toxicity includes only supportive care as no current antidote exists. For instance, charcoal is typically administered in general toxic cases; for wide complex arrhythmias sodium bicarbonate is given. Cardiogenic shock is treated with vasopressors, and/or intravenous lipid emulsion for refractory cases.

ECMO has traditionally played a pivotal role in providing circulatory and respiratory support, effectively stabilizing hemodynamics and oxygenation. ECMO enables the removal of toxic metabolites and provides a bridge to recovery for the compromised myocardium in cardiogenic shock. ECMO offers time for conventional treatments to take effect by lowering the metabolic demands of the patient and supporting end-organ perfusion via volume expansion. Additionally, ECMO allows for the administration of antidotes, such as activated charcoal, hypertonic sodium bicarbonate, and vasopressors. This multimodal approach may be particularly crucial in managing bupropion overdoses with complex pathophysiology.

Using ECMO in poisoned patients is not well-studied, but it may be particularly beneficial for those with cardiovascular failure related to poisoning. ECMO has been used as supportive therapy in pediatric and young adult patients with cardiovascular collapse due to beta-blockers, calcium channel blockers, anti-arrhythmics, and antidepressants.[9-11] An observational study showed mortality rate of approximately 29-30% for critically ill, non-poisoned patients receiving ECMO.[12] A smaller study showed survival is enhanced with the use of ECMO in patients with severe shock due to a poison (86% survival vs 48%).[13] Two notable cases report utilizing ECMO for patients with suspected bupropion toxicity who developed cardiogenic shock and seizures-both patients had rapid recoveries within 6 days of initiating after ECMO.[14] In our case, the patient had significant hemodynamic improvement within 72-hours of initiating ECMO. Despite the growing evidence supporting ECMO as a treatment, there is no current guideline by the American Academy of Clinical Toxicology that includes traditionally using ECMO and/or EGD in bupropion-intoxicated occurrences.[15]

CONCLUSION

Our case underscores the potential of early ECMO initiation in managing severe bupropion overdose complicated by cardiovascular collapse. The observed rapid hemodynamic improvement within 72-hours highlights ECMO's critical role in rescuing patients with significant cardiogenic shock that do not respond well to standard interventions. Furthermore, the successful combination of ECMO with EGD for drug removal emphasizes the importance of a multidisciplinary approach in optimizing outcomes for complex toxic ingestions. We advocate for further research and discussion to consider ECMO's inclusion in management guidelines for bupropion overdose and other toxic ingestions. ECMO is a powerful tool in our efforts to improve patient outcomes and reduce mortality rates.

ACKNOWLEDGMENTS

The authors are thankful to Sarah Carey, MS, Jade Chang, and Jacalyn Newman, PhD, of Allegheny Health Network's Health System Publication Support Office (HSPSO) for their assistance in editing and formatting the manuscript. The HSPSO is funded by Highmark Health (Pittsburgh, PA, United States of America) and all work was done in accordance with Good Publication Practice (GPP3) guidelines (http://www.ismpp.org/gpp3).

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Buckley NA, Dawson AH, Reith DA. Controlled release drugs in overdose. Clinical considerations. Drug Saf. 1995;12(1):73-84.
2. Schmit G, De Boosere E, Vanhaebost J, Capron A. Bupropion overdose resulted in a pharmacobezoar in a fatal bupropion (Wellbutrin®) sustained-release overdose: Postmortem distribution of bupropion and its major metabolites. J Forensic Sci. 2017;62(6):1674-6.
3. Daubin C, Lehoux P, Ivascau C, Tasle M, Bousta M, Lepage O, et al. Extracorporeal life support in severe drug intoxication: A retrospective cohort study of seventeen cases. Crit Care. 2009;13(4):R138.
4. Allen K, Kane I, Connors N, Tecklenburg F, Marvin W. EGD for refractory toxidromes: Is it time to add to the algorithm? J Investig Med High Impact Case Rep. 2022;10:23247096221106760.
5. National Safety Council. Drug overdoses, 2023. Available at: https://injuryfacts.nsc.org/home-and-community/safety-topics/drugoverdoses/. Accessed on 15 April 2024.

6. DiVincenzo F. "How Long Does Wellbutrin Stay in Your System?" K Health, 2022. Available at: khealth.com/learn/antidepressants/howlongdoeswellbutrin-stay-in-your-system/. Accessed on 15 April 2024.
7. Alberter AA, Chambers AJ, Wills BK. Bupropion Toxicity. Treasure Island, FL: StatPearls Publishing; 2022.
8. Johnson NJ, Gaieski DF, Allen SR, Perrone J, DeRoos F. A review of emergency cardiopulmonary bypass for severe poisoning by cardiotoxic drugs. J Med Toxicol. 2013;9(1):54-60.
9. Kolcz J, Pietrzyk J, Januszewska K, Procelewska M, Mroczek T, Malec E. Extracorporeal life support in severe propranolol and verapamil intoxication. J Intensive Care Med. 2007;22(6):381-5.
10. Vignesh C, Kumar M, Venkataraman R, Rajagopal S, Ramakrishnan N, Abraham BK. Extracorporeal Membrane Oxygenation in Drug Overdose: A Clinical Case Series. Indian J Crit Care Med. 2018;22(2):111-5.
11. Australia and New Zealand Extracorporeal Membrane Oxygenation (ANZ ECMO) Influenza Investigators, Davies A, Jones D, et al. Extracorporeal Membrane Oxygenation for 2009 Influenza A(H1N1) Acute Respiratory Distress Syndrome. JAMA. 2009;302(17):1888-95.
12. Masson R, Colas V, Parienti JJ, Lehoux P, Massetti M, Charbonneau P, et al. A comparison of survival with and without extracorporeal life support treatment for severe poisoning due to drug intoxication. Resuscitation. 2012;83(11):1413-7.
13. Heise CW, Skolnik AB, Raschke RA, Owen-Reece H, Graeme KA. Two cases of refractory cardiogenic shock secondary to bupropion successfully treated with veno-arterial extracorporeal membrane oxygenation. J Med Toxicol. 2016;12(3):301-4.
14. American Academy of Clinical Toxicology. Recommendations. American Academy of Clinical Toxicology, 2023. Available at: www.clintox.org/resources/position-states. Accessed on 15 April 2024.

Cite this article as: Simpson MD, Awuah KF, Modugula S, Patel D, Cheema T. From crisis to recovery: a case report and literature review of early extracorporeal membrane oxygenation and esophagogastroduodenoscopy intervention in a patient with extended-release bupropion overdose Int J Res Med Sci 2024;12:2597-600.