

# Successful Management of Severe Verapamil Overdose with VA-ECMO

✉ Vildan Özer<sup>1</sup>, ✉ Ahmet Oğuzhan Küçük<sup>2</sup>, ✉ Ahmet Eroğlu<sup>2</sup>, ✉ Kibar Yaşar Güven<sup>3</sup>, ✉ Hüseyin Çetin Ketenci<sup>4</sup>, ✉ Aynur Şahin<sup>1</sup>, ✉ Ziad Kazzi<sup>5</sup>

<sup>1</sup>Karadeniz Technical University Faculty of Medicine, Department of Emergency Medicine, Trabzon, Turkey

<sup>2</sup>Karadeniz Technical University Faculty of Medicine, Department of Anesthesiology and Reanimation, Trabzon, Turkey

<sup>3</sup>Karadeniz Technical University Faculty of Medicine, Department of Cardiovascular Surgery, Trabzon, Turkey

<sup>4</sup>Trabzon Forensic Medicine Group Presidency, Trabzon, Turkey

<sup>5</sup>Emory University Faculty of Medicine, Department of Emergency Medicine, Atlanta, USA

## Abstract

Calcium channel blocker poisonings are the most common agents causing mortality in worldwide and new approaches and updates on antidotal and supportive treatment are still under the investigation. In this case report, the lifesaving effect of veno-arterial-extracorporeal membrane oxygenation support on the sequel-free health of the patients when exposed to cardiovascular system toxicity such as verapamil+trandolapril isosorbid dinitrate for suicidal purposes was discussed, who developed shock not responding to pharmacotherapy and antidote treatments at the 55<sup>th</sup> hour of drug intake discussed.

**Keywords:** Verapamil, toxicology, ECMO

## Introduction

Calcium channel blocker (CCB) poisonings are the most common agents causing mortality in worldwide and new approaches and updates on antidotal and supportive treatment are still under the investigation. Verapamil is a Class IV antiarrhythmic agent used most commonly for treating supraventricular tachy-arrhythmia and hypertension, and the nondihydropyridine group is a CCB (1,2). The purpose of this case report was to discuss the clinical management of a patient who was stabilized with veno-arterial-extracorporeal membrane oxygenation (VA-ECMO) in the early period of cardiovascular failure, recovered without sequelae in late pharmacotherapy in clinical follow-up after high dose verapamil intake.

## Case Report

A 36-year-old man with a history of hypertension and multiple suicide attempts presented to our emergency department (ED)

approximately 45 min after ingesting in a suicide attempt, his own 42 tablets of Tarka forte® (verapamil hydrochloride/trandolapril-immediate release) 240/4 mg per tablet, 9 tablets of Zestat® (mirtazapine) 15 mg per tablet, and 14 tablets of Isordil® (isosorbid dinitrate) 5 mg per tablet. He was alert, oriented and cooperative. His initial vital signs were stable (heart rate: 90 beats per minute, blood pressure: 110/80 mmHg) and the electrocardiogram showed normal sinus rhythm with no other abnormalities (Figure 1). In the ED, gastric decontamination was performed using an orogastric lavage tube and activated charcoal and many tablets were aspirated via irrigation. Two hours after arrival, the blood pressure decreased to 80/50 mm high and the heart rate increased to 120 beats/minute. The patient's ejection fraction (EF) and wall motion were deemed normal upon bedside echocardiography (ECHO) performed by the emergency physician (ECHO). The patient's blood pressure improved after intravenous fluid bolus and low-dose norepinephrine infusion (0.05 mcg/kg/minute). Fifty-five hours after the ingestion, the blood pressure decreased to 70/50 mmHg and the heart rate was 62 beats per

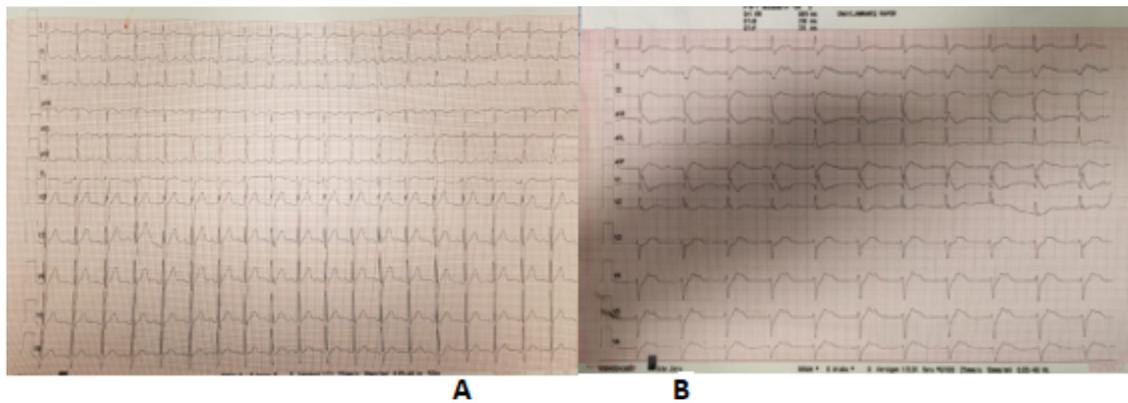


**Corresponding Author:** Vildan Özer MD, Karadeniz Technical University Faculty of Medicine, Department of Emergency Medicine, Trabzon, Turkey  
**Phone:** +90 555 621 61 71 **E-mail:** dr.vilzan@hotmail.com ORCID ID: orcid.org/0000-0002-2514-5674

**Received:** 07.06.2021  
**Accepted:** 09.11.2021

**Cite this article as:** Özer V, Küçük AO, Eroğlu A, Güven KY, Ketenci HÇ, Şahin A, Kazzi Z. Successful Management of Severe Verapamil Overdose with VA-ECMO. Eurasian J Emerg Med. 2022;21(4):277-80.

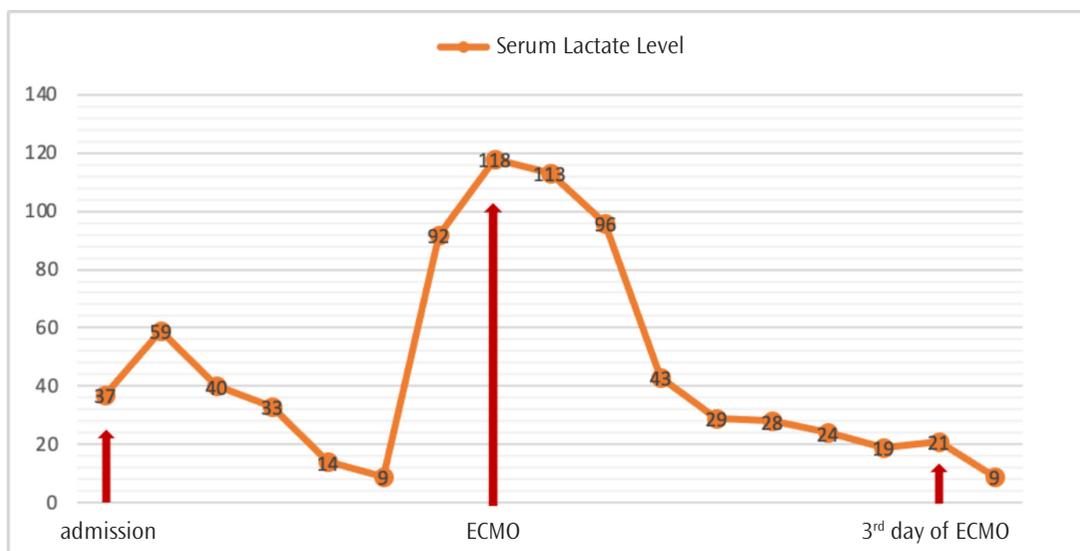
©Copyright 2022 by the Emergency Medicine Physicians' Association of Turkey  
Eurasian Journal of Emergency Medicine published by Galenos Publishing House.



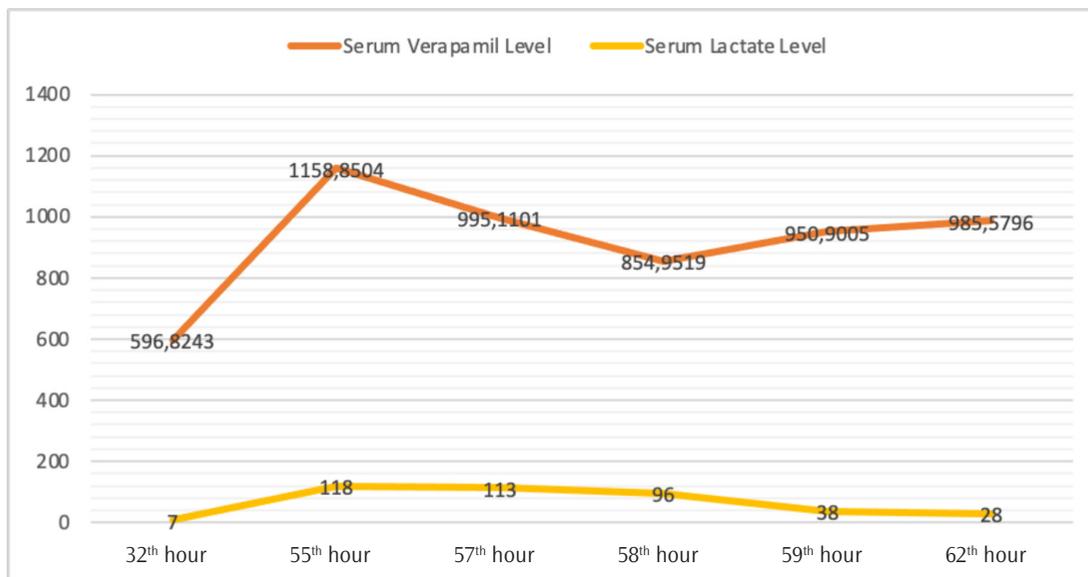
**Figure 1.** A) ECG during the patient’s admission. B) The patient’s ECG just before being placed on ECMO after 55 hours  
ECG: Electrocardiogram, ECMO: Extracorporeal membrane oxygenation

minute. He was given 3 g of calcium gluconate IV, 1 U/kg bolus of intravenous regular insulin followed by a 1 U/kg/hour insulin infusion and the patient was transferred to the general intensive care unit (ICU). The EF remained normal by bedside ECHO despite the low systolic blood pressure that remained low after increasing the insulin infusion rate to 10 U/kg/h and administering 4-g IV of glucagon. The patient was intubated and mechanically ventilated followed by placement on the ECMO device in the ICU with epinephrine infusion 60-hour post-ingestion. After ECMO, the patient’s vital signs improved and need for vasopressors decreased, high dose insulin (HDI) therapy was weaned, urine output increased, and serum lactate decreased. Serial serum lactate levels from the admission to the 3<sup>rd</sup> day of the ECMO device are shown in Figure 2. In the bedside ultrasound imaging, the thickness of the intestinal wall was measured as 5 millimeters in this region, differential diagnosis was ischemic intestine, ileus,

or pharmacobezoars however, no further imaging was obtained because the patient was attached to ECMO device. At the 72 h postingestion after the patient’s clinical condition suddenly worsened and fifteen minutes cardiac arrest period developed, the return of spontaneous circulation occurred after 15 min of cardiopulmonary resuscitation. Diuretic treatment was initiated due to the development of non-cardiogenic pulmonary edema. Vasopressor support was discontinued on the 7<sup>th</sup> day of post-ingestion. The ECMO catheter was discontinued on the 8<sup>th</sup> day of hospital admission and the patient was discharged on the 11<sup>th</sup> day of hospital admission. The blood drug level of the patient was analyzed with LC/MS/MS device in the Forensic Medicine Laboratory. Mirtazapine, trandolapril, and isosorbide dinitrate levels were negative. Serial serum verapamil and lactate levels are shown in Figure 3.



**Figure 2.** Serum lactate (mg/dL) levels  
ECMO: Extracorporeal membrane oxygenation



**Figure 3.** Serum verapamil (ng/mL) and lactate (mg/dL) levels

## Discussion

Previous reports of verapamil poisoning where serial serum verapamil levels were measured, have shown that the peak serum level was achieved and then gradually dropped at earlier hours of presentation (3-6). In this case report, serum verapamil levels peaked at 55 h after the ingestion despite being an immediate-release formulation. This can be due to hypotension-induced hypoperfusion of the intestinal tract and secondary slowing of peristalsis. Again, the decrease in peristalsis due to the antimuscarinic effect of mirtazapine, which was another medication ingested by the patient, may have contributed to slowing peristalsis although the ingestion of this drug was not confirmed by LCMS. Also, it was reported in the literature that pharmacobezoars occur in intestinal structures in multidrug overdoses, and that causes delayed serum peaks and deterioration in the patient's clinical manifestation with the dissolution of this bezoars in decreased intestinal motility (7). It is recommended to start HDI early in cases of CCB poisoning in cases of hemodynamic insufficiency with impaired cardiac contractility (8). Although cardiac EF was checked twice, EF did not decrease, and HDI treatment was given due to the patient's non-responsive status to IV fluid, IV vasopressor and IV calcium, but no clinical response was obtained. ECMO should be considered early in cases where the history and initial clinical findings point toward a critical overdose with high risk of death. VA-ECMO in high dose metoprolol and amlodipine intoxication, and VV-ECMO in high dose verapamil intoxication were successful when applied before cardiac arrest (9,10). Here, the early recommendation of VA-ECMO in addition to the advanced therapies administered played a likely role in the favorable outcome of this critical poisoning.

## Conclusion

Considering the potential risk of cardiac collapse in severe calcium-channel and betablocker poisonings, it is important to plan for the potential need for advanced therapies like ECMO.

## Ethics

**Informed Consent:** Additional informed consent was obtained from all patients for which identifying information is included in this article.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: V.Ö., A.O.K., A.E., K.Y.G., H.Ç.K., A.Ş., Concept: V.Ö., A.O.K., A.E., K.Y.G., H.Ç.K., A.Ş., Z.K., Design: V.Ö., A.O.K., A.E., K.Y.G., H.Ç.K., A.Ş., Z.K., Data Collection or Processing: V.Ö., A.O.K., A.E., K.Y.G., H.Ç.K., A.Ş., Analysis or Interpretation: V.Ö., H.Ç.K., A.Ş., Z.K., Literature Search: V.Ö., A.O.K., A.E., K.Y.G., H.Ç.K., A.Ş., Z.K., Writing: V.Ö., A.Ş., Z.K.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

## References

1. Nordmark Grass J, Ahlner J, Kugelberg FC, Steinwall J, Forsman P, Lindeman E. A case of massive metoprolol and amlodipine overdose with blood concentrations and survival following extracorporeal membrane oxygenation (ECMO). *Clin Toxicol (Phila)*. 2019;57:66-8.
2. Nelson LS, Howland MA, Lewin NA, Smith SW, Goldfrank LR, Hoffman RS. High Dose Insulin. *Goldfrank's Toxicologic Emergencies*, 11th Ed. New York: McGraw-Hill Education, 2019.p.953-8.

3. Ramoska EA, Spiller HA, Myers A. Calcium channel blocker toxicity. *Ann Emerg Med.* 1990;19:649-53.
4. 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;22:381-5.
5. Holzer M, Sterz F, Schoerhuber W, Behringer W, Domanovits H, Weinmar D, et al. "Successful resuscitation of a verapamil-intoxicated patient with percutaneous cardiopulmonary bypass." *Crit Care Med.* 1999;27:2818-23.
6. Kuhlmann U, Schoenemann H, Müller T, Keuchel M, Lange H. Plasmapheresis in life-threatening verapamil intoxication. *Artif Cells Blood Substit Immobil Biotechnol.* 2000;28:429-40.
7. Iwamuro M, Okada H, Matsueda K, Inaba T, Kusumoto C, Imagawa A, et al. Review of the diagnosis and management of gastrointestinal bezoars. *World J Gastrointest Endosc.* 2015;7:336-45.
8. Lheureux PE, Zahir S, Gris M, Derrey AS, Penalzoza A. Bench-to-bedside review: hyperinsulinaemia/euglycaemia therapy in the management of overdose of calcium-channel blockers. *Crit Care.* 2006;10:212.
9. Lewis J, Zarate M, Tran S, Albertson T. The recommendation and use of extracorporeal membrane oxygenation (ECMO) in cases reported to the California Poison Control System. *J Med Toxicol.* 2019;15:169-77.
10. Ho ATN, Pham TN, Barrios CR. Catastrophic Non-Cardiogenic Pulmonary Edema Secondary to Massive Verapamil Overdose and Treatment with Extracorporeal Membrane Oxygenation. *Am J Respir Crit Care Med.* 2020;201:1665.